EOG Resources, Inc.
600 17th St, Suite 1000N
Denver, CO 80202
Main: (303) 572-9000

October 9, 2019

Claudia Smith
Tribal NSR and PSD Permits Lead
U.S. EPA, Region 8
1595 Wynkoop Street, 8P-AR
Denver, Colorado 80202-1129

Re: EOG Resources, Inc. Riverview 30 NWNW 1 Pad (TAT-000233)
Fort Berthold Indian Reservation, McKenzie County, North Dakota
Registration for Oil and Natural Gas Sources
Part 2 – Emission and Production Information

EOG Resources, Inc. (EOG) is submitting an updated Part 2 registration for the Riverview 30 NWNW 1 Pad located on the Ft. Berthold Indian Reservation. This registration application was prepared to meet the requirements of the U.S. EPA Federal Implementation Plan for True Minor Sources in Indian Country in the Oil and Natural Gas Production and Natural Gas Processing Segments of the Oil and Natural Gas Sector, 40 CFR Part 49 issued June 3, 2016.

This registration package includes updated emission and production information since the addition of 6 new producing wells, 3 SI RICE driven gas lift compressors and additional production equipment including separators, heater treaters and storage tanks.

Please contact me by phone at (303) 262-9915 or email at mathew_oliver@eogresources.com with any questions you may have concerning this application.

Sincerely,

Mathew Oliver
Environmental Manager
EOG Resources, Inc. - Denver Division

Cc: R8airpermitting@epa.gov
Edmund Baker, MHA Nation (edmundbaker@mhanation.com)

EPA Form No. 5900-391
EPA ICR No. 1230.27
OMB Control No. 2060-0003
Approval expires 10/31/2020

United States Environmental Protection Agency
https://www.epa.gov/tribal-air/tribal-minor-new-source-review
April 29, 2019

Part 2: Submit Within 60 Days After Startup of Production -- Emission and Production Information

FEDERAL IMPLEMENTATION PLAN FOR TRUE MINOR SOURCES IN INDIAN COUNTRY IN THE OIL AND NATURAL GAS PRODUCTION AND NATURAL GAS PROCESSING SEGMENTS OF THE OIL AND NATURAL GAS SECTOR

Registration for New True Minor Oil and Natural Gas Sources and Minor Modifications at Existing True Minor Oil and Natural Gas Sources

Please submit information to:

[Reviewing Authority Address Phone]	Environmental Protection Agency U.S. EPA, Region 8 1595 Wynkoop Street, 8P-AR Denver, Colorado 80202-1129

A. GENERAL SOURCE INFORMATION (See Instructions Below)

1. Company Name EOG Resources, Inc.		**2. Source Name** Riverview 30 NWNW 1 Pad	
3. Type of Oil and Natural Gas Operation Oil & Gas Wellsite		**4. New Minor Source?** ☒ Yes ☐ No **5. True Source Modification?** ☐ Yes ☒ No	
6. NAICS Code 211120		**7. SIC Code** 1311	
8. U.S. Well ID(s) or API Number(s) [if applicable] 3305303932, 3305303931, 3305307208, 3305307207,3305307206, 3305307205, 3305307204, 3305307203			
9. Area of Indian Country Fort Berthold	**10. County** McKenzie	**11a. Latitude** 47.962444	**11b. Longitude** -102.766917

B. CONTACT INFORMATION (See Instructions Below)

1. Owner Name Mathew Oliver	Title Environmental Manager
Mailing Address 600 17th Street, Suite 1000N Denver, CO 80202	
Email Address mathew_oliver@eogresources.com	
Telephone Number 303-262-9915	Facsimile Number
2. Operator Name (if different from owner)	Title
Mailing Address	
Email Address	
Telephone Number	Facsimile Number
3. Source Contact Mathew Oliver (see owner info above)	Title
Mailing Address	
Email Address	
Telephone Number	Facsimile Number

4. Compliance Contact	Title
Mathew Oliver	Environmental Manager
Mailing Address	
600 17th Street, Suite 1000N Denver, CO 80202	
Email Address	
mathew_oliver@eogresources.com	
Telephone Number	Facsimile Number
303-262-9915	

C. EMISSIONS AND OTHER SOURCE INFORMATION

Include all of the following information in the table below and as attachments to this form:

Note: The emission estimates can be based upon actual test data or, in the absence of such data, upon procedures acceptable to the Reviewing Authority. The following procedures are generally acceptable for estimating emissions from air pollution sources: (1) unit-specific emission tests; (2) mass balance calculations; (3) published, verifiable emission factors that are applicable to the unit (i.e., manufacturer specifications); (4) other engineering calculations; or (5) other procedures to estimate emissions specifically approved by the Reviewing Authority. Guidance for estimating emissions can be found at https://www.epa.gov/chief.

- ■ Narrative description of the operations.
- ■ Identification and description of any air pollution control equipment and compliance monitoring devices or activities.
- ■ Type and actual amount (annually) of each fuel that will be used.
- ■ Type of raw materials used (e.g., water for hydraulic fracturing).
- ■ Actual, annual production rates.
- ■ Actual operating schedules.
- ■ Any existing limitations on source operations affecting emissions or any work practice standards, where applicable, for all regulated New Source Review (NSR) pollutants at your source. Indicate all requirements referenced in the Federal Implementation Plan (FIP) for True Minor Sources in Indian Country in the Oil and Natural Gas Production and Natural Gas Processing Segments of the Oil and Natural Gas Sector that apply to emissions units and air pollution generating activities at the source or proposed. Include statements indicating each emissions unit that is an emissions unit potentially subject to the requirements referenced in the FIP, but does not meet the definition of an affected facility under the referenced requirement, and therefore, is not subject to those requirements.
- ■ For each emissions unit comprising the new source or modification, estimates of the total allowable (potential to emit) annual emissions at startup of production from the air pollution source for the following air pollutants: particulate matter, PM_{10}, $PM_{2.5}$, sulfur oxides ( ), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H_2SO_4), hydrogen sulfide (H_2S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates. Allowable annual emissions are defined as: emissions rate of an emissions unit calculated using the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical

or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation, or the effect it would have on emissions, is legally and practically enforceable. You must determine the potential for emissions within 30 days from the startup of production.

▣ For each emissions unit comprising the new source or modification, estimates of the total actual annual emissions during the upcoming, consecutive 12 months from the air pollution source for the following air pollutants: particulate matter (PM, PM_{10}, $PM_{2.5}$), sulfur oxides (SO_x), nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, ammonia (NH_3), fluorides (gaseous and particulate), sulfuric acid mist (H_2SO_4), hydrogen sulfide (H_2S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates. Estimates of actual emissions must take into account equipment, operating conditions, and air pollution control measures. You should calculate an estimate of the actual annual emissions using estimated operating hours, production rates, in-place control equipment, and types of materials processed, stored, or combusted.

D. TABLE OF ESTIMATED EMISSIONS

Provide in the table below estimates of the total allowable annual emissions in tons per year (tpy) and total actual annual emissions (tpy) for the following pollutants for all emissions units comprising the new source or modification.

POLLUTANT	TOTAL ALLOWABLE ANNUAL EMISSIONS (TPY)	TOTAL ACTUAL ANNUAL EMISSIONS (TPY)
PM	1.70	1.70
PM_{10}	1.70	1.70
$PM_{2.5}$	1.70	1.70
SO_x	0.7	0.7
NO_x	43.60	43.60
CO	62.15	62.15
VOC	57.77	57.77
Pb	0	0

POLLUTANT	TOTAL ALLOWABLE ANNUAL EMISSIONS (TPY)	TOTAL ACTUAL ANNUAL EMISSIONS (TPY)
NH3	0	0
Fluorides	0	0
H_2SO_4	0	0
H_2S	0	0
TRS	0	0

Instructions for Part 2

Please answer all questions. If the item does not apply to the source and its operations write "n/a". If the answer is not known write "unknown".

A. General Source Information

1. Company Name: Provide the complete company name. For corporations, include divisions or subsidiary name, if any.
2. Source Name: Provide the source name. Please note that a source is a site, place, or location that may contain one or more air pollution emitting units.
3. Type of Operation: Indicate the generally accepted name for the oil and natural gas production or natural gas processing segment operation (e.g., oil and gas well site, tank battery, compressor station, natural gas processing plant).
4. New True Minor Source: [Per Federal Indian Country Minor New Source Review Rule, 40 CFR 49.153].
5. True Minor Source Modification: [Per Federal Indian Country Minor New Source Review Rule, 40 CFR 49.153].
6. North American Industry Classification System (NAICS): The NAICS Code for your oil and natural gas source can be found at the following link for North American Industry Classification System: http://www.census.gov/eos/www/naics/.
7. Standard Industrial Classification Code (SIC Code): Although the new NAICS code has replaced the SIC codes, much of the Clean Air Act permitting processes continue to use these codes. The SIC Code for your oil and natural gas source can be found at the following link for Standard Industrial Classification Codes: http://www.osha.gov/pls/imis/sic_manual.html.
8. U.S. Well ID or API Number: Unique well identifier as assigned by the Federal or State oil and gas regulatory agency with primacy, using the American Petroleum Institute (API) Standard for number format (pre-2014) or the Professional Petroleum Data Management (PPDM) Association US Well Number Standard (2014-present). Provide IDs for all oil and natural gas production wells associated with the facility, if applicable. May not be applicable for downstream production sources, such as compressor stations.
9. Area of Indian Country: Provide the name of the Indian reservation within which the source is operating.
10. County: Provide the County within which the source is operating.
11. Latitude & Longitude (11a. and 11b.): Provide latitude and longitude location(s) in decimal degrees, indicating the datum used in parentheses. These are GPS (global positioning system) coordinates. This information should be provided in decimal degrees with 6 digits to the right of the decimal point, indicating the datum used in parentheses (i.e., NAD 27, NAD 83, WGS 84 – WGS 84 is preferred over NAD 27).

B. Contact Information

Please provide the information requested in full.

1. Owners: List the full name (last, middle initial, first) of all owners of the source.
2. Operator: Provide the name of the operator of the source if it is different from the owner(s).
3. Source Contact: The source contact must be the local contact authorized to receive requests for data and information.
4. Compliance Contact: The compliance contact must be the local contact responsible for the source's compliance with this rule. If this is the same as the Source Contact please note this on the form.

C. Attachments

The information requested in the attachments will enable the U.S. Environmental Protection Agency (EPA) to understand the type of oil and natural gas source being registered and the nature and extent of the air pollutants to be emitted.

Disclaimers:

The public reporting and recordkeeping burden for this collection of information is estimated to average 6 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

Information in these forms submitted in compliance with the final Federal Indian Country Minor NSR rule may be claimed as confidential. A company may assert a claim of confidentiality for information submitted by clearly marking that information as confidential. Such information shall be treated in accordance with EPA's procedures for information claimed as confidential at 40 CFR part 2, subpart B, and will only be disclosed by the means set forth in the subpart. If no claim of confidentiality accompanies the report when it is received by EPA, it may be made public without further notice to the company (40 CFR 2.203).

EOG Resources, Inc.

Registration for New True Minor Oil and Natural Gas Sources and Minor Modifications at Existing True Minor Oil and Natural Gas Sources

Part 2: Emission and Production Information

Riverview 30 NWNW 1 PAD (TAT-000233)

Fort Berthold Indian Reservation

McKenzie County, North Dakota

October 9, 2019

1.0 Narrative Description of Operations

Produced oil, natural gas and water flows to the surface through multiple hydraulically fractured wells located on the production facility pad or adjacent production pads through flow lines. The combined well stream flows through a series of separators and treaters. Produced gas separated from the combined well stream is metered and sold through gathering lines. A portion of the gas is used onsite for fuel to the heaters and gas fired engines at the facility or injected back into the formation to provide artificial lift to the producing wells. Produced water is routed to storage tanks and then pumped or trucked offsite for treatment or disposal. Produced oil is passed through heated separators to remove additional entrained gas before going to storage tanks. Oil in the storage tanks is then pumped into gathering pipelines or loaded to tanker trucks for sale.

2.0 Emission Sources

2.1 Fugitive Equipment Leaks (FUG-1)

Fugitive emissions from component leaks were calculated using the Average Emission Factor Approach provided in the EPA's Protocol for Equipment Leaks Emissions Estimate (EPA 453/R-95-017 dated November 1995). This approach for estimating emissions allows use of average emission factors developed by the EPA in combination with unit-specific data that are relatively simple to obtain. The calculated fugitive emissions are based on the following:

- Number of each type of component in a unit (valve, connector, etc.)
- Service of each component (gas, light or heavy liquid)
- VOC/HAP concentration of the stream
- Gas analysis
- Liquid analysis
- EPA Average emission factors for oil and gas production operation

The average emission factors are not intended to provide an accurate estimate of the emission rate from a single piece of equipment. According to EPA, the average factors are more appropriately applied to the estimation of emissions from populations of equipment. Since fugitive emissions from component leaks are estimated from component population, average emission factor accounts for the span of possible leak rates and considered reasonable for this analysis. Hence, screening range approaches were not used for this project.

2.2 Oil Storage Tank Emissions (FL-1, FL-2)

Emissions from oil storage tanks were estimated using AP-42 Chapter 7 methods incorporated into the BR&E ProMax software. Emissions from tank flash, working and breathing losses were calculated considering the inlet oil and gas compositional analysis, separator operating conditions, number of storage tanks, tank dimensions and color and annual average meteorological conditions for the area.

Vapors from storage tanks are routed to a flare through vent lines. VOC and HAP emissions are calculated assuming 98% destruction efficiency at the flare. Vapors from oil storage tanks are captured and recompressed into the gas sales using Vapor Recovery Unit (VRU) compressors, reducing the volume of emissions sent to the flare.

2.3 Produced Water Storage Tank Emissions (FL-1, FL-2)

Emissions from produced water storage tanks were estimated using AP-42 Chapter 7 methods incorporated into the BR&E ProMax software. Emissions from tank flash, working and breathing losses were calculated considering inlet oil and gas compositional analysis, separator operating conditions, number of storage tanks, tank dimensions and color and annual average meteorological conditions for the area. A certain amount of hydrocarbons are dissolved or entrained in the produced water routed to storage tanks. Vapors from produced water storage tanks are routed to a flare through vent lines. VOC and HAP emissions are calculated assuming 98% destruction efficiency at the flare.

2.4 Oil Loadout to Tanker Trucks (L-1, L-2)

Produced oil may be loaded to tanker trucks for transportation to sales when gathering pipeline capacity is not available. Potential emissions from oil loadout were calculated using AP-42 Chapter 5.2: Transportation and Marketing of Petroleum Liquids. Potential emission calculations assume that all produced oil is loaded to tanker trucks, however actual loaded volumes will be significantly lower.

2.5 Produced Water Loadout to Tanker Trucks (L-3)

Produced oil may be loaded to tanker trucks for transportation to disposal when gathering pipeline capacity is not available. Potential emissions from produced water loadout were calculated using AP-42 Chapter 5.2: Transportation and Marketing of Petroleum Liquids. Potential emission calculations assume that all produced water is loaded to tanker trucks, however actual loaded volumes will be significantly lower.

2.6 Natural Gas Fired SI RICE Engines

The facility has three natural gas fired SI RICE engines to drive gas lift compressors.

2.6.1 ENG-1: 1340 hp Caterpillar G3516TALE

ENG-1 is a 4 stroke, lean burn natural gas fired engine rated at 1340 hp. The engine is equipped with oxidation catalyst to reduce CO, VOC and formaldehyde emissions. The engine was manufactured prior to the applicability date for NSPS JJJJ and is therefore not subject to emissions standards. Potential emissions are calculated using manufacturer provided emissions factors without considering controls. Actual emissions after the oxidation catalyst will be significantly lower.

2.6.2 ENG-2: 690 hp Caterpillar G3508B

ENG-2 is a 4 strok, lean burn natural gas fired engine rated at 690 hp. The engine is equipped with oxidation catalyst to reduce CO, VOC and formaldehyde emissions. The engine is subject to the emission standards of NSPS JJJJ. Potential emissions are calculated using NSPS JJJJ standards as the engine will be tested for compliance with these emission levels.

2.6.3 ENG-3: 145 hp Caterpillar G3306 NA

ENG-3 is a 4-stroke, rich burn natural gas fired engine rated at 145 hp. The engine is equipped with NSCR (3-way catalyst) to reduce NOX, CO and VOC emissions. The engine is subject to the emission standards of NSPS JJJJ. Potential emissions are calculated using NSPS JJJJ standards as the engine will be tested for compliance with these emission levels.

2.7 Natural Gas Fired Heaters (HTR-1, 2, 3, 4 & 5)

The facility has five natural gas fired heaters to provide heated separation and heat trace to prevent freezing in cold conditions. The heaters range in size from 1.0 to 2.0 MMBtu/hr. Potential emissions are calculated assuming 8760 hr/yr operation, although actual operation may be limited. Emission factors from AP-42 Chapter 1: External Combustion Sources.

3.0 Control equipment

3.1 Tank Vapor Flares (FL-1, FL-2)

The facility has a low pressure tank vapor flare for each set of oil and produced water tanks to control emissions. The flares are assumed to control VOC emissions with a 98% destruction efficiency.

3.2 High Pressure Flare

The facility is equipped with a high pressure emergency flare for times when high pressure gas must be flared due to high pressure in the gathering line or other issues forcing the facility to be shut in.

4.0 Facility Fuel Use

The following table provides a summary of potential annual fuel use for the natural gas fired SI RICE engines and natural gas fired heaters:

Facility Fuel Use Summary			
Emission Point	Equipment Description	Fuel Type	Annual Fuel Use [MMscf/yr]
HTR-1	2 MMBtu/hr Heater Treater	Fuel Gas	11.68
HTR-2	1.5 MMBtu/hr Heater Treater	Fuel Gas	8.76
HTR-3	1.5 MMBtu/hr Heater Treater	Fuel Gas	8.76
HTR-4	1 MMBtu/hr Heater Treater	Fuel Gas	5.84
HTR-5	1 MMBtu/hr Heater Treater	Fuel Gas	5.84
ENG-1	1340 hp Caterpillar G3516TALE	Fuel Gas	85.22
ENG-2	690 hp Caterpillar G3508B	Fuel Gas	42.99
ENG-3	145 hp Caterpillar G3306 NA	Fuel Gas	9.68
Total			178.77

5.0 Annual Production Rates

The following table provides a summary of Oil, Gas and water production based on the first 30 days of production of the new wells, plus baseline production from the existing wells:

North Production Facility			
Well Name	Avg Gas [Mscfd]	Avg Oil [bbl/d]	Avg Water [bbl/d]
Riverview 4-3031H (existing)	740.82	192.18	260.82
Riverview 100-3031H (existing)	180.60	53.60	106.07
Riverview 21-3032H (NEW)	3,161.56	1,835.74	1,240.04
Total North	4,083	2,082	1,607

South Production Facility			
Well Name	Avg Gas [Mscfd]	Avg Oil [bbl/d]	Avg Water [bbl/d]
Riverview 22-3031H (NEW)	4,926.07	2,006.85	1,628.24
Riverview 23-3031H (NEW)	3,664.60	1,722.86	2,164.21
Riverview 24-3031H (NEW)	3,492.35	1,604.91	2,230.07
Riverview 25-3031H (NEW)	2,504.68	2,172.34	2,231.09
Riverview 26-3031H (NEW)	3,393.17	2,648.30	1,176.91
Total South	17,981	10,155	9,431

6.0 Actual Operating Schedules

The Facility is expected to operate continuously (8760 hours/year) with the exception of downtime for maintenance, lack of product takeaway or emergency events that force production to be shut in.

7.0 Emission Tables

Emission Point	Equipment Description	NO_x		CO		VOC		SO_2		$PM_{10/2.5}$		Formaldehyde		H_2S		Total HAPs	
		lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
FUG-1	Fugitive Equipment Leaks	--	--	--	--	3.55	15.54	--	--	--	--	--	--	--	--	0.19	0.84
FL-1	North Facility Oil Tanks	--	--	--	--	2.01	8.79	--	--	--	--	--	--	--	--	0.13	0.56
FL-1	North Flare Combustion Emissions	0.24	1.04	1.29	5.67	--	--	--	--	--	--	--	--	--	--	--	--
FL-2	South Facility Oil Tanks	--	--	--	--	1.22	5.34	--	--	--	--	--	--	--	--	0.06	0.25
FL-2	South Facility Produced Water Tanks	--	--	--	--	0.10	0.42	--	--	--	--	--	--	--	--	0.01	0.03
FL-2	South Flare Combustion Emissions	0.28	1.22	1.51	6.62	--	--	--	--	--	--	--	--	--	--	--	--
L-1	Uncaptured Oil Loading Emissions to Atmosphere	--	--	--	--	0.97	1.67	--	--	--	--	--	--	--	--	0.04	0.07
L-2	Uncaptured Oil Loading Emissions to Atmosphere	--	--	--	--	1.43	12.84	--	--	--	--	--	--	--	--	0.05	0.43
L-3	Uncaptured Water Loading Emissions to Atmosphere	--	--	--	--	0.00	0.02	--	--	--	--	--	--	--	--	0.00	0.00
HTR-1	2 MMBtu/hr Heater Treater	0.29	1.26	0.24	1.06	0.02	0.07	0.00	0.01	0.02	0.10	--	--	--	--	--	--
HTR-2	1.5 MMBtu/hr Heater Treater	0.22	0.95	0.18	0.80	0.01	0.05	0.00	0.01	0.02	0.07	--	--	--	--	--	--
HTR-3	1.5 MMBtu/hr Heater Treater	0.22	0.95	0.18	0.80	0.01	0.05	0.00	0.01	0.02	0.07	--	--	--	--	--	--
HTR-4	1 MMBtu/hr Heater Treater	0.14	0.63	0.12	0.53	0.01	0.03	0.00	0.00	0.01	0.05	--	--	--	--	--	--
HTR-5	1 MMBtu/hr Heater Treater	0.14	0.63	0.12	0.53	0.01	0.03	0.00	0.00	0.01	0.05	--	--	--	--	--	--
ENG-1	1340 hp Caterpillar G3516TALE	5.91	25.88	5.49	24.07	1.02	4.48	0.01	0.03	0.19	0.84	0.25	1.11	--	--	0.25	1.11
ENG-2	690 hp Caterpillar G3508B	1.52	6.66	3.04	13.33	1.20	5.24	0.00	0.01	0.10	0.43	0.13	0.57	--	--	0.13	0.57
ENG-3	145 hp Caterpillar G3306 NA	1.00	4.38	2.00	8.76	0.73	3.19	0.00	0.00	0.02	0.10	0.03	0.12	--	--	0.03	0.12
TOTALS		**9.95**	**43.60**	**14.19**	**62.15**	**12.28**	**57.77**	**0.02**	**0.07**	**0.39**	**1.70**	**0.41**	**1.81**	**0**	**0**	**0.88**	**3.98**

Fugitive Emissions (FUG-1)

Component Type	Service	Count	Emission Factor (lb/hr)/component	Uncontrolled Emissions lb/hr	Uncontrolled Emissions TPY
Valves	Gas	200	0.00992	1.98	8.69
	Light Oil	200	0.0055	1.10	4.82
	Water/Light Oil	100	0.00216	0.22	0.95
Pumps	Light Oil	8	0.02866	0.23	1.00
	Water/Light Oil	4	0.0000529	0.00	0.00
Flanges	Gas	500	0.00086	0.43	1.88
	Light Oil	500	0.000243	0.12	0.53
	Water/Light Oil	400	0.00000617	0.00	0.01
Compressors	Gas	3	0.0194	0.06	0.25
Relief Valve	Gas	8	0.0194	0.16	0.68
Open Ended Lines	Gas	0	0.00441	0.00	0.00
	Light Oil	0	0.00309	0.00	0.00
	Water/Light Oil	0	0.0006	0.00	0.00
Connectors	Gas	1000	0.00044	0.44	1.93
	Light Oil	1000	0.000463	0.46	2.03
	Water/Light Oil	1000	0.000243	0.24	1.06
Other	Gas	0	0.0194	0.00	0.00
	Light Oil	0	0.0165	0.00	0.00
	Water/Light Oil	0	0.0309	0.00	0.00
	Total	**4923**	**Total Gas Service**	**3.07**	**13.44**
			Total Liquid Service	**2.38**	**10.40**

Hours of Operation: 8760

Compound	Speciation Gas Wt. %	Speciation Liquid Wt.%	Emissions lb/hr	Emissions TPY
Water	0.87%	0.01%	0.03	0.12
Carbon Dioxide	0.98%	0.00%	0.03	0.13
Nitrogen	2.00%	0.00%	0.06	0.27
Methane	34.72%	0.00%	1.07	4.66
Ethane	23.13%	0.09%	0.71	3.12
Propane	17.38%	0.59%	0.55	2.40
Isobutane	2.50%	0.30%	0.08	0.37
n-Butane	7.57%	1.37%	0.26	1.16
Isopentane	3.07%	1.55%	0.13	0.57
n-Pentane	3.43%	2.31%	0.16	0.70
2-Methylpentane	1.23%	1.89%	0.08	0.36
3-Methylpentane	0.44%	0.74%	0.03	0.14
Heptane	0.89%	5.75%	0.16	0.72
Octane	0.25%	5.29%	0.13	0.58
Nonane	0.05%	2.97%	0.07	0.32
Benzene	0.13%	0.31%	0.01	0.05
Toluene	0.16%	1.27%	0.04	0.15
Ethylbenzene	0.03%	0.72%	0.02	0.08
m-Xylene	0.06%	1.55%	0.04	0.17
n-Hexane	1.04%	2.25%	0.09	0.37
2,2,4-Trimethylpentane	0.07%	0.49%	0.01	0.06
C10+	0.00%	70.55%	1.68	7.34
TOTAL	**100.00%**	**100.00%**	**5.44**	**23.84**
TOTAL VOC	**38.30%**	**99.90%**	**3.55**	**15.54**
TOTAL HAPs	**1.36%**	**6.28%**	**0.19**	**0.84**

$$Uncontrolled\ Emissions = Component\ Count \times Emission\ Factor$$

$$Controlled\ Emissions = Component\ Count \times Emission\ Factor \times (1 - Contol\ Factor\%)$$

$$Speciated\ Emissions = (Total\ Gas\ Emissions \times Gas\ Wt\%) + (Total\ Liquid\ Emissions \times Liquid\ Wt\%)$$

Oil Tank Emissions (South)

Number of Oil Tanks:	8
Height	20 ft
Diameter	12 ft
Maximum Capacity	400 bbl

Oil Tank Emissions										
Component	Working		Breathing		Flash*		Total Uncontrolled		Total Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Water	0.0001	0.0006	0.0000	0.0000	0.3707	1.6238	0.3709	1.6244	0.3709	1.6244
Carbon Dioxide	0.0677	0.2964	0.0055	0.0240	0.1480	0.6484	0.2212	0.9689	0.2212	0.9689
Nitrogen	0.0006	0.0027	0.0000	0.0002	0.0132	0.0579	0.0139	0.0608	0.0139	0.0608
Methane	0.2177	0.9533	0.0177	0.0773	1.2736	5.5786	1.5090	6.6092	0.0302	0.1322
Ethane	5.0346	22.0514	0.4084	1.7890	8.0199	35.1270	13.4629	58.9673	0.2693	1.1793
Propane	6.8620	30.0555	0.5567	2.4383	14.8719	65.1388	22.2906	97.6326	0.4458	1.9527
Isobutane	1.1945	5.2320	0.0969	0.4245	2.9430	12.8901	4.2344	18.5466	0.0847	0.3709
n-Butane	3.7203	16.2951	0.3018	1.3220	9.5961	42.0309	13.6183	59.6479	0.2724	1.1930
Isopentane	1.4926	6.5376	0.1211	0.5304	4.3190	18.9174	5.9327	25.9853	0.1187	0.5197
n-Pentane	1.6173	7.0838	0.1312	0.5747	4.9163	21.5333	6.6648	29.1918	0.1333	0.5838
2-Methylpentane	0.5117	2.2411	0.0415	0.1818	1.8176	7.9612	2.3708	10.3840	0.0474	0.2077
3-Methylpentane	0.1798	0.7876	0.0146	0.0639	0.6465	2.8316	0.8409	3.6831	0.0168	0.0737
Heptane	0.2964	1.2980	0.0240	0.1053	1.3344	5.8446	1.6548	7.2479	0.0331	0.1450
Octane	0.0766	0.3354	0.0062	0.0272	0.3781	1.6561	0.4609	2.0187	0.0092	0.0404
Nonane	0.0121	0.0529	0.0010	0.0043	0.0698	0.3058	0.0829	0.3629	0.0017	0.0073
Benzene	0.0348	0.1525	0.0028	0.0124	0.1957	0.8572	0.2334	1.0221	0.0047	0.0204
Toluene	0.0397	0.1738	0.0032	0.0141	0.2385	1.0444	0.2814	1.2324	0.0056	0.0246
Ethylbenzene	0.0072	0.0314	0.0006	0.0025	0.0447	0.1960	0.0525	0.2299	0.0010	0.0046
m-Xylene	0.0186	0.0813	0.0015	0.0066	0.0878	0.3848	0.1079	0.4727	0.0022	0.0095
n-Hexane	0.4230	1.8526	0.0343	0.1503	1.5487	6.7831	2.0060	8.7861	0.0401	0.1757
2,2,4-Trimethylpentane	0.0281	0.1231	0.0023	0.0100	0.1116	0.4889	0.1420	0.6220	0.0028	0.0124
C10+	0.0001	0.0005	0.0000	0.0000	0.0021	0.0090	0.0022	0.0095	0.0000	0.0002
Total	**21.84**	**95.64**	**1.77**	**7.76**	**52.95**	**231.91**	**76.55**	**335.31**	**2.12**	**9.31**
Total VOC	**16.51**	**72.33**	**1.34**	**5.87**	**43.12**	**188.87**	**60.98**	**267.08**	**1.22**	**5.34**
Total HAPs	0.55	2.41	0.04	0.20	2.23	9.75	2.82	12.37	0.06	0.25

*95% of oil tank flash captured by vapor recovery unit

Produced Water Tank Emissions (South)

Number of WaterTanks:	4
Height	20 ft
Diameter	12 ft
Maximum Capacity	400 bbl

Produced Water Tank Emissions										
Component	Working		Breathing		Flash		Total Uncontrolled		Total Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Water	0.2850	1.2482	0.0113	0.0494	0.8032	3.5182	1.0995	4.8158	1.0995	4.8158
Carbon Dioxide	0.0178	0.0778	0.0007	0.0031	0.6531	2.8605	0.6716	2.9414	0.6716	2.9414
Nitrogen	0.0001	0.0004	0.0000	0.0000	0.1732	0.7585	0.1733	0.7590	0.1733	0.7590
Methane	0.0080	0.0351	0.0003	0.0014	5.4953	24.0695	5.5037	24.1061	0.1101	0.4821
Ethane	0.0062	0.0274	0.0002	0.0011	4.6019	20.1564	4.6084	20.1848	0.0922	0.4037
Propane	0.0005	0.0023	0.0000	0.0001	2.5697	11.2555	2.5703	11.2578	0.0514	0.2252
Isobutane	0.0000	0.0000	0.0000	0.0000	0.2466	1.0799	0.2466	1.0800	0.0049	0.0216
n-Butane	0.0000	0.0002	0.0000	0.0000	1.0420	4.5641	1.0421	4.5643	0.0208	0.0913
Isopentane	0.0000	0.0000	0.0000	0.0000	0.2943	1.2889	0.2943	1.2889	0.0059	0.0258
n-Pentane	0.0000	0.0000	0.0000	0.0000	0.1674	0.7334	0.1674	0.7334	0.0033	0.0147
2-Methylpentane	0.0000	0.0000	0.0000	0.0000	0.0753	0.3298	0.0753	0.3298	0.0015	0.0066
3-Methylpentane	0.0000	0.0000	0.0000	0.0000	0.0586	0.2566	0.0586	0.2566	0.0012	0.0051
Heptane	0.0000	0.0000	0.0000	0.0000	0.0212	0.0930	0.0212	0.0930	0.0004	0.0019
Octane	0.0000	0.0000	0.0000	0.0000	0.0029	0.0127	0.0029	0.0127	0.0001	0.0003
Nonane	0.0000	0.0000	0.0000	0.0000	0.0004	0.0018	0.0004	0.0018	0.0000	0.0000
Benzene	0.0000	0.0001	0.0000	0.0000	0.1034	0.4528	0.1034	0.4529	0.0021	0.0091
Toluene	0.0000	0.0000	0.0000	0.0000	0.1261	0.5523	0.1261	0.5523	0.0025	0.0110
Ethylbenzene	0.0000	0.0000	0.0000	0.0000	0.0236	0.1032	0.0236	0.1032	0.0005	0.0021
m-Xylene	0.0000	0.0000	0.0000	0.0000	0.0456	0.1996	0.0456	0.1996	0.0009	0.0040
n-Hexane	0.0000	0.0000	0.0000	0.0000	0.0348	0.1526	0.0348	0.1526	0.0007	0.0031
2,2,4-Trimethylpentane	0.0000	0.0000	0.0000	0.0000	0.0021	0.0091	0.0021	0.0091	0.0000	0.0002
C10+	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0001	0.0003	0.0000	0.0000
Total	**0.32**	**1.39**	**0.01**	**0.06**	**16.54**	**72.45**	**16.87**	**73.90**	**2.24**	**9.82**
Total VOC	**0.00**	**0.00**	**0.00**	**0.00**	**4.81**	**21.09**	**4.81**	**21.09**	**0.10**	**0.42**
Total HAPs	**0.00**	**0.00**	**0.00**	**0.00**	**0.34**	**1.47**	**0.34**	**1.47**	**0.01**	**0.03**

Flare Emissions
Emission Point: FL-2

Flare D.R.E.	98%	
Total Flow to Flare	1,730.7	scf/hr
Flare Gas HHV	2,360.6	Btu/scf

$$\text{Controlled VOC Emissions } \left(\frac{lb}{hr}\right) = Total\ to\ Flare \left(\frac{lb}{hr}\right) \times (1 - Flare\ DRE\%)$$

Emissions to Flare				
Component	Total to Flare		Total Controlled Emissions	
	lb/hr	TPY	lb/hr	TPY
Water	1.4185	6.2129	0.0284	0.1243
Carbon Dioxide	1.4764	6.4668	0.0295	0.1293
Nitrogen	0.9604	4.2064	0.0192	0.0841
Methane	8.4051	36.8143	0.1681	0.7363
Ethane	36.4731	159.7520	0.7295	3.1950
Propane	64.3414	281.8152	1.2868	5.6363
Isobutane	11.5404	50.5467	0.2308	1.0109
n-Butane	35.3145	154.6776	0.7063	3.0936
Isopentane	8.6849	38.0398	0.1737	0.7608
n-Pentane	11.1749	48.9461	0.2235	0.9789
2-Methylpentane	1.9192	8.4060	0.0384	0.1681
3-Methylpentane	1.2324	5.3979	0.0246	0.1080
Heptane	3.0567	13.3885	0.0611	0.2678
Octane	0.4233	1.8542	0.0085	0.0371
Nonane	0.1682	0.7368	0.0034	0.0147
Benzene	1.0724	4.6970	0.0214	0.0939
Toluene	0.0813	0.3561	0.0016	0.0071
Ethylbenzene	0.0369	0.1615	0.0007	0.0032
m-Xylene	0.1061	0.4645	0.0021	0.0093
n-Hexane	3.1982	14.0082	0.0640	0.2802
2,2,4-Trimethylpentane	1.3231	5.7952	0.0265	0.1159
C10+	0.0007	0.0031	0.0000	0.0001
Total	**192.41**	**842.75**	**3.85**	**16.85**
Total VOC	**143.67**	**629.29**	**2.87**	**12.59**
Total HAPs	**5.82**	**25.48**	**0.12**	**0.51**

$$\text{NO}_X \text{ or CO Emissions } \left(\frac{lb}{hr}\right) = Emission\ Factor \left(\frac{lb}{MMBtu}\right) \times Flow\ to\ Flare \left(\frac{scf}{hr}\right) \times Flare \text{ Gas HHV } \left(\frac{Btu}{scf}\right) \times \frac{MMBtu}{10^6 Btu}$$

Flare Combustion Emissions			
Component	EF [lb/MMBtu]	lb/hr	TPY
NO_X	0.068	**0.28**	**1.22**
CO	0.37	**1.51**	**6.62**

[1]NOx & CO emission factors are from AP-42 Table 13.5-1 ((Emission Factors for Flare Operations).)

Oil Loadout Losses (South)
Emission Point: L-2

$$L_L = 12.46 \times \frac{SPM}{T}$$

Where

LL =	6.89	Loading Loss, lb/1000 gallons liquid Loaded
S =	1.00	Saturation Factor
P =	6.19	True Vapor of liquid loaded (psia)
M =	45.13	MW of Vapors (lb/lbmole)
T =	505.44	Temperature of bulk liquid loaded (R)

S Factor	Mode of operation
0.50	Submerged loading of a clean cargo tank
0.60	Submerged loading: dedicated normal service
1.00	Submerged loading: dedicated vapor balance service
1.45	Splash loading of a clean cargo tank
1.45	Splash loading: dedicated normal service
1.00	Splash loading: dedicated vapor balance service

Annual Throughput	9,825	bbl/d
	150,615,786	gal/yr
Max Hourly Throughput	200	bbl/hr
	8,400	gal/hr
VOC wt%	75.63%	
Total HAP wt%	2.52%	

Vapor Collection Efficiency	98.70%
Flare Vapor Destruction Eff.	98.00%
Overall reduction efficiency	96.73%

	lb/hr	TPY
VOC	**1.43**	**12.84**
Total HAPS	**0.05**	**0.43**

Loading Loss Vapor Wt. %	
Water	0.00%
Carbon Dioxide	0.31%
Nitrogen	0.00%
Methane	1.00%
Ethane	23.06%
Propane	31.43%
Isobutane	5.47%
n-Butane	17.04%
Isopentane	6.84%
n-Pentane	7.41%
2-Methylpentane	2.34%
3-Methylpentane	0.82%
Heptane	1.36%
Octane	0.35%
Nonane	0.06%
Benzene	0.16%
Toluene	0.18%
Ethylbenzene	0.03%
m-Xylene	0.08%
n-Hexane	1.94%
2,2,4-Trimethylpentane	0.13%
C10+	0.00%
Total	100.00%
Total VOC	**75.63%**
Total HAPs	**2.52%**

$$Emissions(lb/hr) = \frac{Max\ hourly\ TP(gal/hr)}{1000} \times L_L(lb/1000gal) \times Wt.\% \times (1 - ORE\%)$$

$$Emissions(TPY) = \frac{Annual\ Throughput(gal/yr)}{1000} \times L_L(lb/1000gal) \times \frac{ton}{2000lbs} \times Wt.\% \times (1 - ORE\%)$$

Water Loadout Losses (South)
Emission Point: L-3

$$L_L = 12.46 \times \frac{SPM}{T}$$

Where

LL =	0.14	Loading Loss, lb/1000 gallons liquid Loaded
S =	1.45	Saturation Factor
P =	0.21	True Vapor of liquid loaded (psia)
M =	18.75	MW of Vapors (lb/lbmole)
T =	505.44	Temperature of bulk liquid loaded (R)

S Factor	Mode of operation
0.50	Submerged loading of a clean cargo tank
0.60	Submerged loading: dedicated normal service
1.00	Submerged loading: dedicated vapor balance service
1.45	Splash loading of a clean cargo tank
1.45	Splash loading: dedicated normal service
1.00	Splash loading: dedicated vapor balance service

Annual Throughput	10,983	bbl/d
	168,365,310	gal/yr
Max Hourly Throughput	200	bbl/hr
	8,400	gal/hr
VOC wt%	0.19%	
Total HAP wt%	0.01%	

Vapor Collection Efficiency	0.00%
Flare Vapor Destruction Eff.	98.00%
Overall reduction efficiency	0.00%

	lb/hr	TPY
VOC	**0.00**	**0.02**
Total HAPS	**0.00**	**0.00**

Loading Loss Vapor Wt. %	
Water	89.70%
Carbon Dioxide	5.59%
Nitrogen	0.03%
Methane	2.53%
Ethane	1.97%
Propane	0.16%
Isobutane	0.00%
n-Butane	0.01%
Isopentane	0.00%
n-Pentane	0.00%
2-Methylpentane	0.00%
3-Methylpentane	0.00%
Heptane	0.00%
Octane	0.00%
Nonane	0.00%
Benzene	0.01%
Toluene	0.00%
Ethylbenzene	0.00%
m-Xylene	0.00%
n-Hexane	0.00%
2,2,4-Trimethylpentane	0.00%
C10+	0.00%
Total	100.00%
Total VOC	**0.19%**
Total HAPs	**0.01%**

$$Emissions(lb/hr) = \frac{Max\ hourly\ TP(gal/hr)}{1000} \times L_L(lb/1000gal) \times Wt.\% \times (1 - ORE\%)$$

$$Emissions(TPY) = \frac{Annual\ Throughput(gal/yr)}{1000} \times L_L(lb/1000gal) \times \frac{ton}{2000lbs} \times Wt.\% \times (1 - ORE\%)$$

Oil Tank Emissions (North)

Number of Oil Tanks:	14
Height	20 ft
Diameter	12 ft
Maximum Capacity	400 bbl

Oil Tank Emissions										
Component	Working		Breathing		Flash		Total Uncontrolled		Total Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Water	0.0002	0.0007	0.0001	0.0002	3.7037	16.2220	3.7039	16.2229	0.0741	0.3245
Carbon Dioxide	0.0416	0.1823	0.0130	0.0570	0.7445	3.2608	0.7991	3.5001	0.0160	0.0700
Nitrogen	0.0018	0.0077	0.0005	0.0024	0.3072	1.3457	0.3095	1.3558	0.0062	0.0271
Methane	0.2632	1.1528	0.0823	0.3607	12.6522	55.4167	12.9978	56.9302	0.2600	1.1386
Ethane	2.0725	9.0774	0.6484	2.8402	27.1589	118.9560	29.8798	130.8736	0.5976	2.6175
Propane	1.8562	8.1300	0.5808	2.5437	32.9125	144.1568	35.3494	154.8305	0.7070	3.0966
Isobutane	0.2861	1.2531	0.0895	0.3921	5.7508	25.1886	6.1264	26.8338	0.1225	0.5367
n-Butane	0.8823	3.8643	0.2760	1.2091	18.6214	81.5617	19.7797	86.6351	0.3956	1.7327
Isopentane	0.3738	1.6373	0.1170	0.5123	8.7977	38.5340	9.2885	40.6837	0.1858	0.8137
n-Pentane	0.4254	1.8634	0.1331	0.5830	10.5156	46.0585	11.0742	48.5050	0.2215	0.9701
2-Methylpentane	0.1525	0.6681	0.0477	0.2090	4.4138	19.3323	4.6140	20.2094	0.0923	0.4042
3-Methylpentane	0.0607	0.2659	0.0190	0.0832	1.7776	7.7858	1.8573	8.1349	0.0371	0.1627
Heptane	0.1121	0.4912	0.0351	0.1537	4.1160	18.0282	4.2633	18.6731	0.0853	0.3735
Octane	0.0316	0.1386	0.0099	0.0434	1.2675	5.5518	1.3091	5.7337	0.0262	0.1147
Nonane	0.0052	0.0226	0.0016	0.0071	0.2422	1.0609	0.2490	1.0906	0.0050	0.0218
Benzene	0.0117	0.0514	0.0037	0.0161	0.5338	2.3381	0.5492	2.4056	0.0110	0.0481
Toluene	0.0154	0.0675	0.0048	0.0211	0.7454	3.2649	0.7657	3.3536	0.0153	0.0671
Ethylbenzene	0.0030	0.0130	0.0009	0.0041	0.1493	0.6539	0.1532	0.6710	0.0031	0.0134
m-Xylene	0.0078	0.0339	0.0024	0.0106	0.2943	1.2888	0.3044	1.3334	0.0061	0.0267
n-Hexane	0.1364	0.5976	0.0427	0.1870	4.0668	17.8125	4.2459	18.5970	0.0849	0.3719
2,2,4-Trimethylpentane	0.0106	0.0464	0.0033	0.0145	0.3419	1.4973	0.3558	1.5583	0.0071	0.0312
C10+	0.0000	0.0002	0.0000	0.0001	0.0071	0.0313	0.0072	0.0315	0.0001	0.0006
Total	**6.75**	**29.57**	**2.11**	**9.25**	**139.12**	**609.35**	**147.98**	**648.16**	**2.96**	**12.96**
Total VOC	**4.37**	**19.14**	**1.37**	**5.99**	**94.55**	**414.15**	**100.29**	**439.28**	**2.01**	**8.79**
Total HAPs	0.18	0.81	0.06	0.25	6.13	26.86	6.37	27.92	0.13	0.56

Flare Emissions
Emission Point: FL-1

Flare D.R.E.	98%	
Total Flow to Flare	1,596.7	scf/hr
Flare Gas HHV	2,190.2	Btu/scf

$$\text{Controlled VOC Emissions } \left(\frac{lb}{hr}\right) = Total\ to\ Flare \left(\frac{lb}{hr}\right) \times (1 - Flare\ DRE\%)$$

Emissions to Flare				
Component	Total to Flare		Total Controlled Emissions	
	lb/hr	TPY	lb/hr	TPY
Water	3.7043	16.2248	0.0741	0.3245
Carbon Dioxide	0.9087	3.9801	0.0182	0.0796
Nitrogen	0.3142	1.3760	0.0063	0.0275
Methane	13.6909	59.9663	0.2738	1.1993
Ethane	35.3380	154.7807	0.7068	3.0956
Propane	40.2379	176.2422	0.8048	3.5248
Isobutane	6.8800	30.1342	0.1376	0.6027
n-Butane	22.1033	96.8124	0.4421	1.9362
Isopentane	10.2730	44.9959	0.2055	0.8999
n-Pentane	12.1946	53.4126	0.2439	1.0683
2-Methylpentane	5.0157	21.9689	0.1003	0.4394
3-Methylpentane	2.0171	8.8351	0.0403	0.1767
Heptane	4.5586	19.9667	0.0912	0.3993
Octane	1.3924	6.0988	0.0278	0.1220
Nonane	0.2626	1.1501	0.0053	0.0230
Benzene	0.5801	2.5410	0.0116	0.0508
Toluene	0.8063	3.5314	0.0161	0.0706
Ethylbenzene	0.1610	0.7053	0.0032	0.0141
m-Xylene	0.3248	1.4228	0.0065	0.0285
n-Hexane	4.6052	20.1708	0.0921	0.4034
2,2,4-Trimethylpentane	0.3837	1.6806	0.0077	0.0336
C10+	0.0073	0.0321	0.0001	0.0006
Total	**165.76**	**726.03**	**3.32**	**14.52**
Total VOC	**111.80**	**489.70**	**2.24**	**9.79**
Total HAPs	**6.86**	**30.05**	**0.14**	**0.60**

$$\text{NO}_X \text{ or CO Emissions } \left(\frac{lb}{hr}\right) = Emission\ Factor \left(\frac{lb}{MMBtu}\right) \times Flow\ to\ Flare \left(\frac{scf}{hr}\right) \times Flare \text{ Gas HHV } \left(\frac{Btu}{scf}\right) \times \frac{MMBtu}{10^6 Btu}$$

Flare Combustion Emissions			
Component	EF [lb/MMBtu]	lb/hr	TPY
NO_X	0.068	**0.24**	**1.04**
CO	0.37	**1.29**	**5.67**

[1]NOx & CO emission factors are from AP-42 Table 13.5-1 ((Emission Factors for Flare Operations).)

Oil Loadout Losses (North)
Emission Point: L-1

$$L_L = 12.46 \times \frac{SPM}{T}$$

Where

LL =	5.46	Loading Loss, lb/1000 gallons liquid Loaded
S =	1.00	Saturation Factor
P =	5.43	True Vapor of liquid loaded (psia)
M =	40.76	MW of Vapors (lb/lbmole)
T =	505.44	Temperature of bulk liquid loaded (R)

S Factor	Mode of operation
0.50	Submerged loading of a clean cargo tank
0.60	Submerged loading: dedicated normal service
1.00	Submerged loading: dedicated vapor balance service
1.45	Splash loading of a clean cargo tank
1.45	Splash loading: dedicated normal service
1.00	Splash loading: dedicated vapor balance service

Annual Throughput	1,885	bbl/d
	28,897,355	gal/yr
Max Hourly Throughput	200	bbl/hr
	8,400	gal/hr
VOC wt%	64.75%	
Total HAP wt%	2.74%	

Vapor Collection Efficiency	98.70%
Flare Vapor Destruction Eff.	98.00%
Overall reduction efficiency	96.73%

	lb/hr	TPY
VOC	**0.97**	**1.67**
Total HAPS	**0.04**	**0.07**

Loading Loss Vapor Wt. %	
Water	0.00%
Carbon Dioxide	0.62%
Nitrogen	0.03%
Methane	3.90%
Ethane	30.70%
Propane	27.50%
Isobutane	4.24%
n-Butane	13.07%
Isopentane	5.54%
n-Pentane	6.30%
2-Methylpentane	2.26%
3-Methylpentane	0.90%
Heptane	1.66%
Octane	0.47%
Nonane	0.08%
Benzene	0.17%
Toluene	0.23%
Ethylbenzene	0.04%
m-Xylene	0.11%
n-Hexane	2.02%
2,2,4-Trimethylpentane	0.16%
C10+	0.00%
Total	100.00%
Total VOC	**64.75%**
Total HAPs	**2.74%**

$$Emissions(lb/hr) = \frac{Max\ hourly\ TP(gal/hr)}{1000} \times L_L(lb/1000gal) \times Wt.\% \times (1 - ORE\%)$$

$$Emissions(TPY) = \frac{Annual\ Throughput(gal/yr)}{1000} \times L_L(lb/1000gal) \times \frac{ton}{2000lbs} \times Wt.\% \times (1 - ORE\%)$$

eog resources

Heater Attributes		
EPN	HTR-1	
Manufacturer:		
Model	Heater Treater	
Description	2 MMBtu/hr Heater Treater	
Burner Rating	2	MMBtu/hr
Fuel Gas HHV	1500	Btu/scf
Operating hours	8760	hr/yr

Stack Attributes		
Stack Height	20	ft
Stack Diameter	0.667	ft
Exhaust Temp	460	°F
Exhaust Flow	576.44	ACFM
Exit Velocity	27.52	ft/s

Pollutant	Uncontrolled Emissions				Controlled Emissions			
	EF	Unit	lb/hr	TPY	EF	Unit	lb/hr	TPY
NOX	100	lb/MMscf	0.29	1.26	100	lb/MMscf	0.29	1.26
CO	84	lb/MMscf	0.24	1.06	84	lb/MMscf	0.24	1.06
VOC	5.5	lb/MMscf	0.02	0.07	5.5	lb/MMscf	0.02	0.07
SO2	0.6	lb/MMscf	0.00	0.01	0.6	lb/MMscf	0.00	0.01
PM10	7.6	lb/MMscf	0.02	0.10	7.6	lb/MMscf	0.02	0.10
CO2	120,000	lb/MMscf	346.02	1515.57	120,000	lb/MMscf	346.02	1515.57

$$Emission\ rate\ \left(\frac{lb}{hr}\right) = Burner\ Rating\ \left(\frac{MMBtu}{hr}\right) \times \frac{1}{1020\ \left(Btu/scf\right)} \times EF\left(\frac{lbs}{MMscf}\right) \times \left(\frac{HHV}{1020}\right)$$

Annual Fuel Use		
Natural Gas	11,680,000	scf/yr
	11.68	MMscf/yr

$$Annual\ fuel\ use\ \left(\frac{scf}{yr}\right) = Burner\ rating\ \left(\frac{MMBtu}{hr}\right) \times \frac{10^6 Btu}{MMBtu} \times \frac{1}{LHV(Btu/scf)} \times Operating\ hours\ \left(\frac{hr}{yr}\right)$$

eog resources

Heater Attributes		
EPN	HTR-2	
Manufacturer:		
Model	Heater Treater	
Description	1.5 MMBtu/hr Heater Treater	
Burner Rating	1.5	MMBtu/hr
Fuel Gas HHV	1500	Btu/scf
Operating hours	8760	hr/yr

Stack Attributes		
Stack Height	20	ft
Stack Diameter	0.667	ft
Exhaust Temp	460	°F
Exhaust Flow	432.33	ACFM
Exit Velocity	20.64	ft/s

Pollutant	Uncontrolled Emissions				Controlled Emissions			
	EF	Unit	lb/hr	TPY	EF	Unit	lb/hr	TPY
NOX	100	lb/MMscf	0.22	0.95	100	lb/MMscf	0.22	0.95
CO	84	lb/MMscf	0.18	0.80	84	lb/MMscf	0.18	0.80
VOC	5.5	lb/MMscf	0.01	0.05	5.5	lb/MMscf	0.01	0.05
SO2	0.6	lb/MMscf	0.00	0.01	0.6	lb/MMscf	0.00	0.01
PM10	7.6	lb/MMscf	0.02	0.07	7.6	lb/MMscf	0.02	0.07
CO2	120,000	lb/MMscf	259.52	1136.68	120,000	lb/MMscf	259.52	1136.68

$$Emission\ rate\ \left(\frac{lb}{hr}\right) = Burner\ Rating\ \left(\frac{MMBtu}{hr}\right) \times \frac{1}{1020\ \left(Btu/scf\right)} \times EF\left(\frac{lbs}{MMscf}\right) \times \left(\frac{HHV}{1020}\right)$$

Annual Fuel Use		
Natural Gas	8,760,000	scf/yr
	8.76	MMscf/yr

$$Annual\ fuel\ use\ \left(\frac{scf}{yr}\right) = Burner\ rating\ \left(\frac{MMBtu}{hr}\right) \times \frac{10^6 Btu}{MMBtu} \times \frac{1}{LHV(Btu/scf)} \times Operating\ hours\ \left(\frac{hr}{yr}\right)$$

eog resources

Heater Attributes		
EPN	HTR-3	
Manufacturer:		
Model	Heater Treater	
Description	1.5 MMBtu/hr Heater Treater	
Burner Rating	1.5	MMBtu/hr
Fuel Gas HHV	1500	Btu/scf
Operating hours	8760	hr/yr

Stack Attributes		
Stack Height	20	ft
Stack Diameter	0.667	ft
Exhaust Temp	460	°F
Exhaust Flow	432.33	ACFM
Exit Velocity	20.64	ft/s

Pollutant	Uncontrolled Emissions				Controlled Emissions			
	EF	Unit	lb/hr	TPY	EF	Unit	lb/hr	TPY
NOX	100	lb/MMscf	0.22	0.95	100	lb/MMscf	0.22	0.95
CO	84	lb/MMscf	0.18	0.80	84	lb/MMscf	0.18	0.80
VOC	5.5	lb/MMscf	0.01	0.05	5.5	lb/MMscf	0.01	0.05
SO2	0.6	lb/MMscf	0.00	0.01	0.6	lb/MMscf	0.00	0.01
PM10	7.6	lb/MMscf	0.02	0.07	7.6	lb/MMscf	0.02	0.07
CO2	120,000	lb/MMscf	259.52	1136.68	120,000	lb/MMscf	259.52	1136.68

$$Emission\ rate\ \left(\frac{lb}{hr}\right) = Burner\ Rating\ \left(\frac{MMBtu}{hr}\right) \times \frac{1}{1020\ \left(Btu/scf\right)} \times EF\left(\frac{lbs}{MMscf}\right) \times \left(\frac{HHV}{1020}\right)$$

Annual Fuel Use		
Natural Gas	8,760,000	scf/yr
	8.76	MMscf/yr

$$Annual\ fuel\ use\ \left(\frac{scf}{yr}\right) = Burner\ rating\ \left(\frac{MMBtu}{hr}\right) \times \frac{10^6 Btu}{MMBtu} \times \frac{1}{LHV(Btu/scf)} \times Operating\ hours\ \left(\frac{hr}{yr}\right)$$

eog resources

Heater Attributes		
EPN	HTR-4	
Manufacturer:		
Model	Heater Treater	
Description	1 MMBtu/hr Heater Treater	
Burner Rating	1	MMBtu/hr
Fuel Gas HHV	1500	Btu/scf
Operating hours	8760	hr/yr

Stack Attributes		
Stack Height	20	ft
Stack Diameter	0.667	ft
Exhaust Temp	460	°F
Exhaust Flow	288.22	ACFM
Exit Velocity	13.76	ft/s

Pollutant	Uncontrolled Emissions				Controlled Emissions			
	EF	Unit	lb/hr	TPY	EF	Unit	lb/hr	TPY
NOX	100	lb/MMscf	0.14	0.63	100	lb/MMscf	0.14	0.63
CO	84	lb/MMscf	0.12	0.53	84	lb/MMscf	0.12	0.53
VOC	5.5	lb/MMscf	0.01	0.03	5.5	lb/MMscf	0.01	0.03
SO2	0.6	lb/MMscf	0.00	0.00	0.6	lb/MMscf	0.00	0.00
PM10	7.6	lb/MMscf	0.01	0.05	7.6	lb/MMscf	0.01	0.05
CO2	120,000	lb/MMscf	173.01	757.79	120,000	lb/MMscf	173.01	757.79

$$Emission\ rate\ \left(\frac{lb}{hr}\right) = Burner\ Rating\ \left(\frac{MMBtu}{hr}\right) \times \frac{1}{1020\ \left(Btu/scf\right)} \times EF\left(\frac{lbs}{MMscf}\right) \times \left(\frac{HHV}{1020}\right)$$

Annual Fuel Use		
Natural Gas	5,840,000	scf/yr
	5.84	MMscf/yr

$$Annual\ fuel\ use\ \left(\frac{scf}{yr}\right) = Burner\ rating\ \left(\frac{MMBtu}{hr}\right) \times \frac{10^6 Btu}{MMBtu} \times \frac{1}{LHV(Btu/scf)} \times Operating\ hours\ \left(\frac{hr}{yr}\right)$$

eog resources

Heater Attributes		
EPN	HTR-5	
Manufacturer:		
Model	Heater Treater	
Description	1 MMBtu/hr Heater Treater	
Burner Rating	1	MMBtu/hr
Fuel Gas HHV	1500	Btu/scf
Operating hours	8760	hr/yr

Stack Attributes		
Stack Height	20	ft
Stack Diameter	0.667	ft
Exhaust Temp	460	°F
Exhaust Flow	288.22	ACFM
Exit Velocity	13.76	ft/s

Pollutant	Uncontrolled Emissions				Controlled Emissions			
	EF	Unit	lb/hr	TPY	EF	Unit	lb/hr	TPY
NOX	100	lb/MMscf	0.14	0.63	100	lb/MMscf	0.14	0.63
CO	84	lb/MMscf	0.12	0.53	84	lb/MMscf	0.12	0.53
VOC	5.5	lb/MMscf	0.01	0.03	5.5	lb/MMscf	0.01	0.03
SO2	0.6	lb/MMscf	0.00	0.00	0.6	lb/MMscf	0.00	0.00
PM10	7.6	lb/MMscf	0.01	0.05	7.6	lb/MMscf	0.01	0.05
CO2	120,000	lb/MMscf	173.01	757.79	120,000	lb/MMscf	173.01	757.79

$$Emission\ rate\ \left(\frac{lb}{hr}\right) = Burner\ Rating\ \left(\frac{MMBtu}{hr}\right) \times \frac{1}{1020\ \left(Btu/scf\right)} \times EF\left(\frac{lbs}{MMscf}\right) \times \left(\frac{HHV}{1020}\right)$$

Annual Fuel Use		
Natural Gas	5,840,000	scf/yr
	5.84	MMscf/yr

$$Annual\ fuel\ use\ \left(\frac{scf}{yr}\right) = Burner\ rating\ \left(\frac{MMBtu}{hr}\right) \times \frac{10^6 Btu}{MMBtu} \times \frac{1}{LHV(Btu/scf)} \times Operating\ hours\ \left(\frac{hr}{yr}\right)$$

eog resources

Engine Attributes		
EPN	ENG-1	
Manufacturer:	Caterpillar	
Model	G3516TALE	
Description	1340 hp Caterpillar G3516TALE	
Serial Number	WPW00857	
Ignition Type	Spark Ignited	
Cycle/Burn Type	4SLB	
Power Rating	1340	hp
Fuel Consumption	7405	Btu/(hp-hr)
Fuel LHV	1020	Btu/scf
Operating hours	8760	hr/yr

Stack Attributes		
Stack Height	25	ft
Stack Diameter	1	ft
Exhaust Temp	873	°F
Exhaust Flow	7663	ACFM
Exit Velocity	162.61	ft/s

Pollutant	Uncontrolled Emissions				Controlled Emissions			
	EF	Unit	lb/hr	TPY	EF	Unit	lb/hr	TPY
NO_X	2.00	g/hp-hr	5.91	25.88	2.00	g/hp-hr	5.91	25.88
CO	1.86	g/hp-hr	5.49	24.07	1.86	g/hp-hr	5.49	24.07
VOC	0.26	g/hp-hr	0.77	3.36	0.26	g/hp-hr	0.77	3.36
SO_2	5.88E-04	lb/MMBtu	0.01	0.03	5.88E-04	lb/MMBtu	0.01	0.03
PM10	1.94E-02	lb/MMBtu	0.19	0.84	1.94E-02	lb/MMBtu	0.19	0.84
CO2	471	g/hp-hr	1,391	6,094	471	g/hp-hr	1,391	6,094

$$Emission\ rate\ \left(\frac{lb}{hr}\right) = EF\left(\frac{g}{hp-hr}\right) \times Power\ Rating(bhp) \times \left(\frac{1\ lb}{453.6\ g}\right)$$

$$Emission\ rate\ \left(\frac{lb}{hr}\right) = EF\left(\frac{lb}{MMBtu}\right) \times Power\ Rating(bhp) \times \text{Fuel Consumption}\ \left(\frac{Btu}{hp-hr}\right) \times \frac{MMBtu}{10^6 Btu}$$

Annual Fuel Use		
Natural Gas	85,218,482	scf/yr
	85.22	MMscf/yr

$$Annual\ fuel\ use\ \left(\frac{scf}{yr}\right) = Power\ Rating(bhp) \times Fuel\ Consumption\left(\frac{Btu}{hp-hr}\right) \times \frac{1}{LHV(Btu/scf)} \times Operating\ hours\ \left(\frac{hr}{yr}\right)$$

Engine Attributes		
EPN	ENG-2	
Manufacturer:	Caterpillar	
Model	G3508B	
Description	690 hp Caterpillar G3508B	
Serial Number	RBK01499	
Ignition Type	Spark Ignited	
Cycle/Burn Type	4SLB	
Power Rating	690	hp
Fuel Consumption	7254	Btu/(hp-hr)
Fuel LHV	1020	Btu/scf
Operating hours	8760	hr/yr

Stack Attributes		
Stack Height	25	ft
Stack Diameter	0.833333333	ft
Exhaust Temp	931	°F
Exhaust Flow	4455	ACFM
Exit Velocity	136.13	ft/s

Pollutant	Uncontrolled Emissions				Controlled Emissions			
	EF	Unit	lb/hr	TPY	EF	Unit	lb/hr	TPY
NO_X	0.50	g/hp-hr	0.76	3.33	1.00	g/hp-hr	1.52	6.66
CO	2.58	g/hp-hr	3.92	17.19	2.00	g/hp-hr	3.04	13.33
VOC	0.55	g/hp-hr	0.84	3.66	0.70	g/hp-hr	1.06	4.66
SO_2	5.88E-04	lb/MMBtu	0.00	0.01	5.88E-04	lb/MMBtu	0.00	0.01
PM10	1.94E-02	lb/MMBtu	0.10	0.43	1.94E-02	lb/MMBtu	0.10	0.43
CO2	477	g/hp-hr	726	3,178	477	g/hp-hr	726	3,178

$$Emission\ rate\ \left(\frac{lb}{hr}\right) = EF\left(\frac{g}{hp-hr}\right) \times Power\ Rating(bhp) \times \left(\frac{1\ lb}{453.6\ g}\right)$$

$$Emission\ rate\ \left(\frac{lb}{hr}\right) = EF\left(\frac{lb}{MMBtu}\right) \times Power\ Rating(bhp) \times \text{Fuel Consumption}\ \left(\frac{Btu}{hp-hr}\right) \times \frac{MMBtu}{10^6 Btu}$$

Annual Fuel Use		
Natural Gas	42,986,351	scf/yr
	42.99	MMscf/yr

$$Annual\ fuel\ use\ \left(\frac{scf}{yr}\right) = Power\ Rating(bhp) \times Fuel\ Consumption\left(\frac{Btu}{hp-hr}\right) \times \frac{1}{LHV(Btu/scf)} \times Operating\ hours\ \left(\frac{hr}{yr}\right)$$

eog resources

Engine Attributes		
EPN	ENG-3	
Manufacturer:	Caterpillar	
Model	G3306 NA	
Description	145 hp Caterpillar G3306 NA	
Serial Number	R6S05866	
Ignition Type	Spark Ignited	
Cycle/Burn Type	4SRB	
Power Rating	145	hp
Fuel Consumption	7775	Btu/(hp-hr)
Fuel LHV	1020	Btu/scf
Operating hours	8760	hr/yr

Stack Attributes		
Stack Height	15	ft
Stack Diameter	0.5	ft
Exhaust Temp	1160	°F
Exhaust Flow	706	ACFM
Exit Velocity	59.93	ft/s

Pollutant	Uncontrolled Emissions				Controlled Emissions			
	EF	Unit	lb/hr	TPY	EF	Unit	lb/hr	TPY
NO_X	1.00	g/hp-hr	0.32	1.40	1.00	g/hp-hr	1.00	4.38
CO	2.00	g/hp-hr	0.64	2.80	2.00	g/hp-hr	2.00	8.76
VOC	0.70	g/hp-hr	0.22	0.98	0.70	g/hp-hr	0.70	3.07
SO_2	5.88E-04	lb/MMBtu	0.00	0.00	5.88E-04	lb/MMBtu	0.00	0.00
PM10	1.94E-02	lb/MMBtu	0.02	0.10	1.94E-02	lb/MMBtu	0.02	0.10
CO2	489	g/hp-hr	156	685	489	g/hp-hr	156	685

$$Emission\ rate\ \left(\frac{lb}{hr}\right) = EF\left(\frac{g}{hp-hr}\right) \times Power\ Rating(bhp) \times \left(\frac{1\ lb}{453.6\ g}\right)$$

$$Emission\ rate\ \left(\frac{lb}{hr}\right) = EF\left(\frac{lb}{MMBtu}\right) \times Power\ Rating(bhp) \times \text{Fuel Consumption}\ \left(\frac{Btu}{hp-hr}\right) \times \frac{MMBtu}{10^6 Btu}$$

Annual Fuel Use		
Natural Gas	9,682,162	scf/yr
	9.68	MMscf/yr

$$Annual\ fuel\ use\ \left(\frac{scf}{yr}\right) = Power\ Rating(bhp) \times Fuel\ Consumption\left(\frac{Btu}{hp-hr}\right) \times \frac{1}{LHV(Btu/scf)} \times Operating\ hours\ \left(\frac{hr}{yr}\right)$$

8.0 Hydrocarbon Liquid and Gas Analyses

PRECISION ANALYSIS
GAS MEASUREMENT EMISSIONS TESTING LABORATORY
307.856.0866
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EXTENDED HYDROCARBON LIQUID STUDY
CERTIFICATE OF ANALYSIS

Company:	**EOG Resources**	Sample Name:	**Riverview 4-3031H**
Date Sampled:	06/25/2013	Sample Number:	13070207-06
Sample Location:	North Dakota	Date Tested:	07/03/2013
Sample Pressure:	38 PSI	Test Method:	GPA 2186M
Sample Temperature:	117 DEG F		
County:	McKenzie	Date Reported:	7/3/2013
		Note: Due to the nature of H2S, the values of	
Sampling Method:	GPA-2174	H2S reported may be lower than actual.	
Type Sample:	SPOT		

Components	Mole %	Weight %	Liq. Vol. %
Hydrogen Sulfide	0.0000	0.000	0.000
Oxygen	0.0000	0.000	0.000
Carbon Dioxide	0.0219	0.007	0.006
Nitrogen	0.0298	0.006	0.005
Methane	0.5631	0.061	0.155
Ethane	1.7923	0.367	0.780
Propane	3.6680	1.100	1.644
iso-Butane	0.9556	0.378	0.509
n-Butane	3.9721	1.570	2.037
iso-Pentane	4.5556	2.235	2.711
n-Pentane	5.5047	2.701	3.246
Hexanes	4.2452	2.488	2.840
Heptanes	8.1783	5.574	6.139
Octanes	6.6275	5.149	5.524
Nonanes	3.3366	2.911	3.055
Decanes+	46.4630	68.936	64.949
Benzene	0.4558	0.242	0.207
Toluene	1.9870	1.245	1.082
Ethylbenzene	0.9883	0.714	0.620
Xylenes	2.1248	1.534	1.343
n-Hexane	3.8636	2.265	2.585
2,2,4-Trimethylpentane	0.6669	0.518	0.564
Totals	100.000	100.000	100.000

ADDITIONAL BTEX DATA

Components	Mole %	Weight %	Liq. Vol. %
2-Methylpentane	3.035	1.779	2.031
3-Methylpentane	1.210	0.709	0.809
n-Hexane	3.864	2.265	2.585
2,2,4-Trimethylpentane	0.667	0.518	0.564
Benzene	0.456	0.242	0.207
Toluene	1.987	1.245	1.082
Ethylbenzene	0.988	0.714	0.620
m-Xylene	0.244	0.176	0.154
p-Xylene	1.519	1.097	0.960
o-Xylene	0.361	0.261	0.228

API GRAVITY AT 60/60 F, calculated	**55.2**
SPECIFIC GRAVITY AT 60/60 F, calculated	**0.75799**
RELATIVE SPECIFIC GRAVITY OF DECANES+ (C10+) FRACTION, calculated	**0.80452**
AVERAGE MOLECULAR WEIGHT	**147.029**
AVERAGE MOLECULAR WEIGHT OF DECANES+ (C10+) FRACTION, calculated	**218.143**
TRUE VAPOR PRESSURE AT 100 F, PSIA, calculated	**54.607**
AVERAGE BOILING POINT, F, calculated	**319.644**
CUBIC FEET OF GAS / GALLON OF LIQUID, as Ideal Gas, calculated	**19.341**
BTU / GALLON OF LIQUID AT 14.73 PSIA, calculated	**122,860.88**
LBS / GALLON OF LIQUID, calculated	**6.319**

NOTATION: ALL CALCULATIONS PERFORMED USING PHYSICAL CONSTANTS FROM GPA 2145-09, THE TABLES OF PHYSICAL CONSTANTS FOR HYDROCARBONS AND OTHER COMPOUNDS OF INTEREST TO THE NATURAL GAS INDUSTRY.

FLASHED CRUDE OIL LIQUID STUDIES
CERTIFICATE OF ANALYSIS

Sample Name: **Riverview 4-3031H**
Sample Number: 13070207-05

TEST PERFORMED	RESULTS	DATE TESTED
API GRAVITY AT 60/60 F, (ASTM D-1298), calculated from SG	44.6	07/03/2013
SPECIFIC GRAVITY AT 60/60 F (ASTM D-1657), measured	0.8037	07/03/2013
REID VAPOR PRESSURE (ASTM D6377), PSIG AT 100 F, measured	6.93	07/03/2013

PRECISION ANALYSIS

GAS MEASUREMENT EMISSIONS TESTING LABORATORY

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Client:	EOG Resources-Williston Basin	**Analysis Date:**	8/5/2015
Sample ID:	RIVERVIEW 102-32H	**Date Sampled:**	7/21/15
Unique #:	NI	**Purpose:**	NI
Sample Temperature:	142 DEG F	**Sample Pressure:**	180 PSI
Sampled By:	Mike Honeyman	**Type Sample:**	Spot
County:	McKenzie		

Components	Mole %	Weight %	Liq. Vol. %
Carbon Dioxide.....	0.6069	1.014	0.485
Hydrogen Sulfide.....	0.0000	0.000	0.000
Nitrogen.....	1.9074	2.028	0.982
Methane.....	58.3061	35.493	46.256
Ethane.....	20.7450	23.670	25.962
Propane.....	10.5242	17.609	13.568
iso-Butane.....	1.1541	2.545	1.767
n-Butane.....	3.5536	7.837	5.243
iso-Pentane.....	0.6805	1.863	1.165
n-Pentane.....	1.0500	2.875	1.781
Cyclopentane.....	0.0633	0.168	0.088
n-Hexane.....	0.3110	1.017	0.598
Cyclohexane.....	0.1333	0.426	0.212
Other Hexanes	0.3288	1.075	0.633
Heptanes.....	0.2934	1.115	0.633
Methylcyclohexane.....	0.0974	0.363	0.183
2,2,4-Trimethylpentane...	0.0000	0.000	0.000
Benzene.....	0.0931	0.276	0.122
Toluene.....	0.0502	0.175	0.079
Ethylbenzene.....	0.0018	0.007	0.003
Xylenes.....	0.0078	0.031	0.014
Octanes.....	0.0764	0.331	0.183
Nonanes.....	0.0074	0.036	0.020
Decanes+.....	0.0081	0.044	0.023
Totals	100.000	100.000	100.000

ADDITIONAL BETX DATA

Components	Mole %	Weight %	Liq. Vol. %
Cyclopentane	0.0633	0.168	0.088
Cyclohexane	0.1333	0.426	0.212
2-Methylpentane	0.2070	0.677	0.398
3-Methylpentane	0.1219	0.398	0.235
n-Hexane	0.3110	1.017	0.598
Methylcyclohexane	0.0974	0.363	0.183
2,2,4-Trimethylpentane	0.0000	0.000	0.000
Benzene	0.0931	0.276	0.122
Toluene	0.0502	0.175	0.079
Ethylbenzene	0.0018	0.007	0.003
m-Xylene	0.0012	0.005	0.002
p-Xylene	0.0053	0.021	0.010
o-Xylene	0.0013	0.005	0.002

SPECIFIC GRAVITY @ 60/60 F, calculated	0.9099
TOTAL GPM (Ethane Inclusive)	11.133
CALCULATED BTU / REAL CF @ 14.73 PSIA, dry basis	1525.940
CALCULATED BTU / REAL CF @ 14.73 PSIA, wet basis	1500.116
AVERAGE MOLECULAR WEIGHT	26.354
MOLAR MASS RATIO	0.9092
RELATIVE DENSITY (G x Z (Air) / Z), calculated	0.9153
IDEAL GROSS HEATING VALUE, BTU / IDEAL CF @ 14.696 PSIA	1513.404
COMPRESSIBILITY FACTOR (Z)	0.99407

PROPANE GPM	2.8920
BUTANE GPM	1.4942
GASOLINE GPM (PENTANE AND HEAVIER)	1.2127

TOTAL ACID GAS MOLE %	0.6069
H2S MOLE %	0.0000
H2S PPM	0

VOC WEIGHT FRACTION	0.377
HIGHER HEATING VALUE (BTU/ft^3)	1519.733
LOWER HEATING VALUE (BTU/ft^3)	1385.995

NOTATION: ALL CALCULATIONS PERFORMED USING PHYSICAL CONSTANTS FROM GPA 2145-09, THE TABLES OF PHYSICAL CONSTANTS FOR HYDROCARBONS AND OTHER COMPOUNDS OF INTEREST TO THE NATURAL GAS INDUSTRY.

9.0 Equipment Specifications

August 29, 2019

Archrock AQT
Archrock
9807 Katy Frwy., Ste. 100
Houston, TX 77024

Archrock
9807 Katy Frwy., Ste. 100
Houston, Texas 77024 U.S.A.
Main 281.836.8000
www.archrock.com

Pedigree for Archrock Unit 77918: Engine Serial Number WPW00857, Compressor Serial Number F26808

In order to better assist your company with its state and federal permitting needs, Archrock submits the following information in regards to the engine and compressor of the above-referenced compressor unit, which Archrock is currently utilizing to provide your company contract compression services. This letter should provide information necessary to answer questions pertaining to, but not limited to, the New Source Performance Standards (NSPS), Subpart JJJJ, Subpart OOOO, and Subpart OOOOa. This information is current as of August 29, 2019.

Engine Make:	CATERPILLAR	**Compressor Make:**	ARIEL
Engine Model:	G3516TALE AFR	**Compressor Model:**	JGT4
Engine Serial Number:	WPW00857	**Compressor Serial Number:**	F26808
Engine Type:	4 Stroke LB	**Compressor Type:**	Reciprocating
Engine Category:	Existing	**Compressor Category:**	Existing
Engine Subcategory:	Non Certified	**Compressor Stages:**	3
Engine NSPS Status*:	Exempt	**Compressor NSPS Status*:**	Exempt
Engine Speed:	1400	**Compressor Speed:**	1500
OEM Rated Engine HP:	1340	**OEM Rated Compressor HP:**	2600
Engine Mfr. Date:	4/9/2007	**Compressor Mfr. Date:**	6/29/2007

Engine NSPS Justification*: Overhauls since 6/12/06 have not triggered recon./modif.

Compressor NSPS Justification*: The mfr. date is before 8/23/2011 and recon./modif. have not been triggered.

Customer: EOG RESOURCES INC

Business Unit: ROCKIES

Archrock Unit Number: 77918

Customer Lease Name: RIVERVIEW SECTION 30 3516

Please contact AQT@archrock.com with any questions.

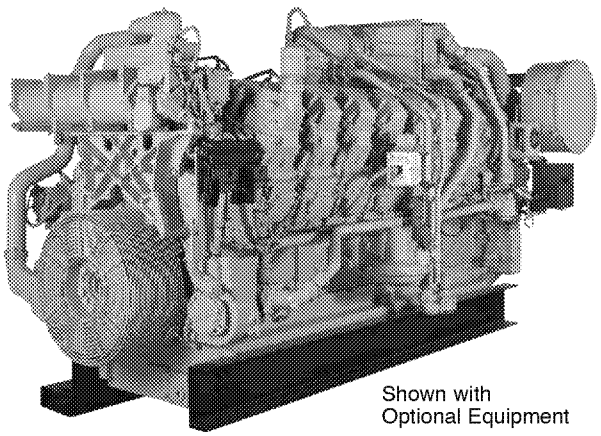
* The "Engine NSPS Status", "Compressor NSPS Status", "Engine Exemption Justification", and "Compressor Exemption Justification" entries herein are based on Archrock's present knowledge of the engine and compressor in question and its reading of U.S. EPA's regulations and guidance pursuant to 40 C.F.R. Part 60, Subpart JJJJ, Subpart OOOO, and Subpart OOOOa. Any change in law or in the federal, state, or local interpretation of existing law could result in this engine being subject to additional or different legal requirements. These conclusions are Archrock's and are not offered as legal opinions or advice to your company. Additionally, any reconstruction or modification respecting this engine or compressor (as those terms are defined in the applicable regulations) could result in the applicability of Subpart JJJJ, Subpart OOOO, Subpart OOOOa, or other legal requirements to this engine or compressor and create legal compliance responsibilities for your company.

CATERPILLAR®

G3516 LE Gas Petroleum Engine

858-999 bkW
1150-1340 bhp
1200-1400 rpm

2.0 g/bhp-hr NOx (NTE)



Shown with Optional Equipment

CAT® ENGINE SPECIFICATIONS

V-16, 4-Stroke-Cycle

Bore	170 mm (6.7 in.)
Stroke	190 mm (7.5 in.)
Displacement	69 L (4210 cu. in.)
Aspiration	Turbocharged-Aftercooled
Digital Engine Management Governor and Protection	Electronic (ADEM™ A3)
Combustion	Low Emission (Lean Burn)
Engine Weight, net dry (approx)	8015 kg (17,670 lb)
Power Density	8 kg/kW (13.2 lb/bhp)
Power per Displacement	19.3 bhp/L
Total Cooling System Capacity	217.7 L (57.5 gal)
Jacket Water	200.6 L (53 gal)
Aftercooler Circuit	17 L (4.5 gal)
Lube Oil System (refill)	424 L (112 gal)
Oil Change Interval	1000 hours
Rotation (from flywheel end)	Counterclockwise
Flywheel and Flywheel Housing	SAE No. 00
Flywheel Teeth	183

FEATURES

Engine Design
- Proven reliability and durability
- Ability to burn a wide spectrum of gaseous fuels
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Broad operating speed range

Emissions
Meets U.S. EPA Spark Ignited Stationary NSPS Emissions for 2007/8

Lean Burn Engine Technology
Lean-burn engines operate with large amounts of excess air. The excess air absorbs heat during combustion reducing the combustion temperature and pressure, greatly reducing levels of NOx. Lean-burn design also provides longer component life and excellent fuel consumption.

Advanced Digital Engine Management
ADEM A3 control system providing integrated ignition, speed governing, protection, and controls, including detonation-sensitive variable ignition timing. ADEM A3 has improved: user interface, display system, shutdown controls, and system diagnostics.

Ease of Operation
Side covers on block allow for inspection of internal components

Full Range of Attachments
Large variety of factory-installed engine attachments reduces packaging time

Testing
Every engine is full-load tested to ensure proper engine performance.

Gas Engine Rating Pro
GERP is a PC-based program designed to provide site performance capabilities for Cat® natural gas engines for the gas compression industry. GERP provides engine data for your site's altitude, ambient temperature, fuel, engine coolant heat rejection, performance data, installation drawings, spec sheets, and pump curves.

Product Support Offered Through Global Cat Dealer Network
More than 2,200 dealer outlets

Cat factory-trained dealer technicians service every aspect of your petroleum engine

Cat parts and labor warranty

Preventive maintenance agreements available for repair-before-failure options

S•O•S℠ program matches your oil and coolant samples against Caterpillar set standards to determine:
- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

Over 80 Years of Engine Manufacturing Experience
Over 60 years of natural gas engine production

Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products.
- Cast engine blocks, heads, cylinder liners, and flywheel housings
- Machine critical components
- Assemble complete engine

Web Site
For all your petroleum power requirements, visit www.catoilandgas.cat.com.

STANDARD EQUIPMENT

Air Inlet System
Air cleaner — intermediate-duty with service indicator

Control System
A3 ECU
Air-fuel ratio control

Cooling System
Thermostats and housing
Jacket water pump
Aftercooler water pump
Aftercooler core for sea-air atmosphere
Aftercooler thermostats and housing

Exhaust System
Watercooled exhaust manifolds

Flywheels & Flywheel Housings
SAE No. 00 flywheel
SAE No. 00 flywheel housing
SAE standard rotation

Fuel System
Gas pressure regulator
Natural gas carburetor

Ignition System
A3 ECU

Instrumentation
PL1000 Advisor panel

Lubrication System
Crankcase breather — top mounted
Oil cooler
Oil filter — RH
Oil bypass filter
Oil pan — shallow
Oil sampling valve
Turbo oil accumulator

Mounting System
Rails, engine mounting — 254 mm (10 in)

Protection System
Electronic shutoff system
Gas shutoff valve

General
Paint — Cat yellow
Vibration damper and guard — dual 484 mm (23 in)

OPTIONAL EQUIPMENT

Air Inlet System
Remote air inlet adapters
Precleaner

Charging System
Battery chargers
Charging alternators

Cooling System
Aftercooler core
Thermostatic valve
Temperature switch
Connections
Expansion and overflow tank
Water level switch gauge

Exhaust System
Flexible fittings
Elbows
Flange
Flange and exhaust expanders
Rain cap
Mufflers

Fuel System
Low pressure gas conversions
Propane gas valve and jet kits
Fuel filter

Instrumentation
PL1000 communications modules

Lubrication System
Oil bypass filter removal and oil pan accessories
Sump pump
Air prelube pump
Manual prelube pump
Lubricating oil

Mounting System
Rails
Vibration isolators

Power Take-Offs
Front accessory drives
Auxiliary drive shafts and pulleys
Front stub shaft
Pulleys

Protection System
Explosion relief valves, status control box interconnect wiring harness

Starting System
Air starting motor
Air pressure regulator
Air silencer
Electric air start controls
Electric starting motors — dual 24-volt
Starting aids
Battery sets (24-volt dry), cables, and rack

General
Flywheel intertia weight
Guard removal
Engine barring group
Premium 8:1 pistons
Premium cylinder heads

TECHNICAL DATA

G3516 LE Gas Petroleum Engine

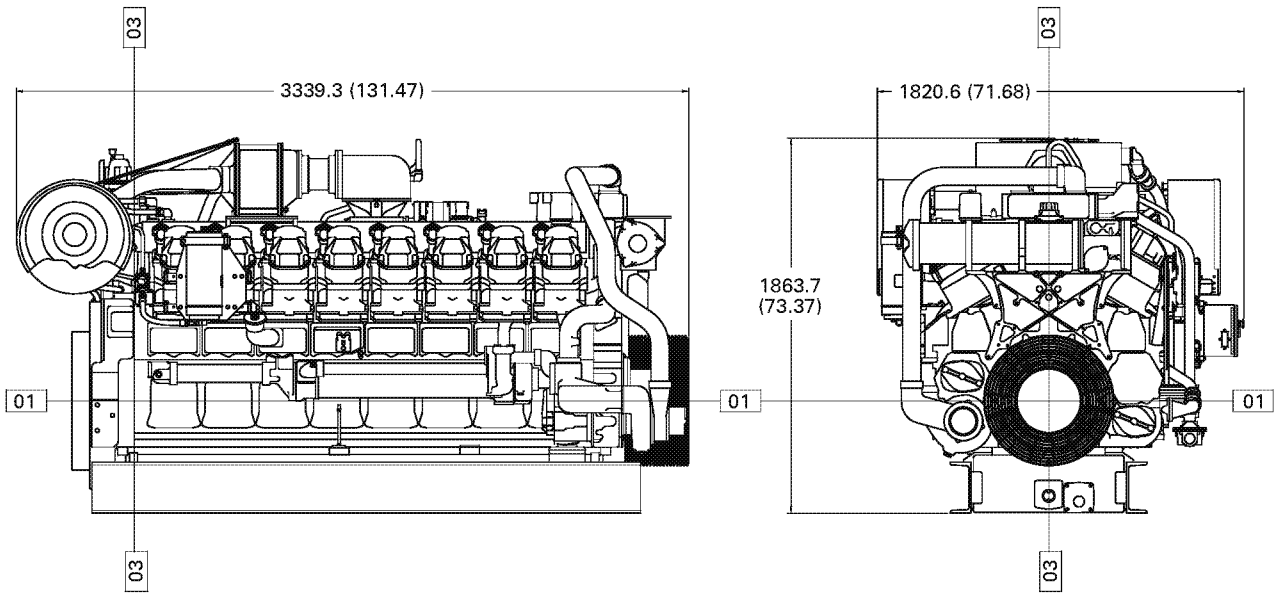
Fuel System		2 g NOx NTE Rating DM8618-01	2 g NOx NTE Rating DM8620-01
Engine Power			
@ 100% Load	bkW (bhp)	999 (1340)	858 (1150)
@ 75% Load	bkW (bhp)	749 (1004)	643 (862)
Engine Speed	rpm	**1400**	**1200**
Max Altitude @ Rated Torque and 38°C (100°F)	m (ft)	304.8 (1000)	1219.2 (4000)
Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F)	%	25	9.2
SCAC Temperature	°C (°F)	54 (130)	54 (130)
Emissions*			
NOx	g/bkW-hr (g/bhp-hr)	2.68 (2)	2.68 (2)
CO	g/bkW-hr (g/bhp-hr)	2.49 (1.86)	2.35 (1.75)
CO_2	g/bkW-hr (g/bhp-hr)	632 (471)	624 (466)
VOC**	g/bkW-hr (g/bhp-hr)	0.35 (0.26)	0.4 (0.3)
Fuel Consumption***			
@ 100% Load	MJ/bkW-hr (Btu/bhp-hr)	10.48 (7405)	10.36 (7324)
@ 75% Load	MJ/bkW-hr (Btu/bhp-hr)	10.79 (7628)	10.76 (7605)
Heat Balance			
Heat Rejection to Jacket Water			
@ 100% Load	bkW (Btu/mn)	741 (42,123)	639 (36,343)
@ 75% Load	bkW (Btu/mn)	616.7 (35,075)	554 (31,480)
Heat Rejection to Aftercooler			
@ 100% Load	bkW (Btu/mn)	167.8 (9546)	131.9 (7509)
@ 75% Load	bkW (Btu/mn)	108.6 (6179)	72.2 (4108)
Heat Rejection to Exhaust			
@ 100% Load LHV to 25° C (77° F)	bkW (Btu/mn)	837.8 (47,643)	694.6 (39,536)
@ 75% Load LHV to 25° C (77° F)	bkW (Btu/mn)	630.4 (35,848)	524.1 (29,806)
Exhaust System			
Exhaust Gas Flow Rate			
@ 100% Load	m^3/min (cfm)	217.0 (7663)	182.9 (6460)
@ 75% Load	m^3/min (cfm)	163.8 (5785)	138.9 (4905)
Exhaust Stack Temperature			
@ 100% Load	°C (°F)	467.22 (873)	452.2 (846)
@ 75% Load	°C (°F)	467.22 (873)	450.5 (843)
Intake System			
Air Inlet Flow Rate			
@ 100% Load	m^3/min (scfm)	80.6 (2847)	69.5 (2453)
@ 75% Load	m^3/min (scfm)	60.8 (2147)	52.8 (1864)
Gas Pressure	kPag (psig)	241.5-275.8 (35-40)	241.5-275.8 (35-40)

*at 100% load and speed, all values are listed as not to exceed

**Volatile organic compounds as defined in U.S. EPA 40 CFR 60, subpart JJJJ

***ISO 3046/1

GAS PETROLEUM ENGINE



DIMENSIONS		
Length	mm (in.)	3339.3 (131.47)
Width	mm (in.)	1820.6 (71.68)
Height	mm (in.)	1863.7 (73.37)
Shipping Weight	kg (lb)	8015 (17,670)

Note: General configuration not to be used for installation. See general dimension drawings for detail (drawing #289-2971).

Dimensions are in mm (inches).

RATING DEFINITIONS AND CONDITIONS

Engine performance is obtained in accordance with SAE J1995, ISO3046/1, BS5514/1, and DIN6271/1 standards.

Transient response data is acquired from an engine/ generator combination at normal operating temperature and in accordance with ISO3046/1 standard ambient conditions. Also in accordance with SAE J1995, BS5514/1, and DIN6271/1 standard reference conditions.

Conditions: Power for gas engines is based on fuel having an LHV of 33.74 kJ/L (905 Btu/cu ft) at 101 kPa (29.91 in. Hg) and 15° C (59° F). Fuel rate is based on a cubic meter at 100 kPa (29.61 in. Hg) and 15.6° C (60.1° F). Air flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and 25° C (77° F). Exhaust flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and stack temperature.

Performance Numbers: DM8618-01, DM8620-01
LEHW0036-00 (11-09)
Supersedes LEHW6046-02

August 29, 2019

Archrock AQT
Archrock
9807 Katy Frwy., Ste. 100
Houston, TX 77024

Archrock
9807 Katy Frwy., Ste. 100
Houston, Texas 77024 U.S.A.
Main 281.836.8000
www.archrock.com

Pedigree for Archrock Unit 805912: Engine Serial Number RBK01499, Compressor Serial Number F48884

In order to better assist your company with its state and federal permitting needs, Archrock submits the following information in regards to the engine and compressor of the above-referenced compressor unit, which Archrock is currently utilizing to provide your company contract compression services. This letter should provide information necessary to answer questions pertaining to, but not limited to, the New Source Performance Standards (NSPS), Subpart JJJJ, Subpart OOOO, and Subpart OOOOa. This information is current as of August 29, 2019.

Engine Make:	CATERPILLAR	**Compressor Make:**	ARIEL
Engine Model:	G3508B	**Compressor Model:**	JGJ4
Engine Serial Number:	RBK01499	**Compressor Serial Number:**	F48884
Engine Type:	4 Stroke LB	**Compressor Type:**	Reciprocating
Engine Category:	New	**Compressor Category:**	New
Engine Subcategory:	Non Certified	**Compressor Stages:**	3
Engine NSPS Status*:	Non-Exempt	**Compressor NSPS Status*:**	Non-Exempt
Engine Speed:	1400	**Compressor Speed:**	1800
OEM Rated Engine HP:	690	**OEM Rated Compressor HP:**	1240
Engine Mfr. Date:	10/13/2014	**Compressor Mfr. Date:**	12/12/2014

Engine NSPS Justification*: This engine was manufactured after the Quad J applicability date.

Compressor NSPS Justification*: This compressor was manufactured after the Quad O applicability date.

Customer: EOG RESOURCES INC

Business Unit: ROCKIES

Archrock Unit Number: 805912

Customer Lease Name: RIVERVIEW SECTION 30 3508

Please contact AQT@archrock.com with any questions.

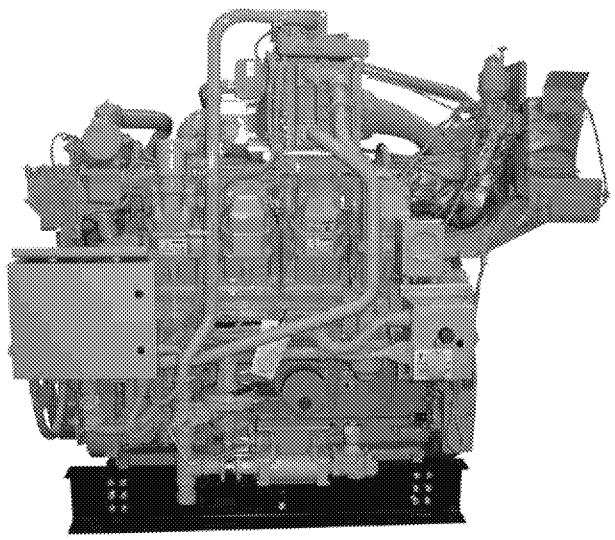
* The "Engine NSPS Status", "Compressor NSPS Status", "Engine Exemption Justification", and "Compressor Exemption Justification" entries herein are based on Archrock's present knowledge of the engine and compressor in question and its reading of U.S. EPA's regulations and guidance pursuant to 40 C.F.R. Part 60, Subpart JJJJ, Subpart OOOO, and Subpart OOOOa. Any change in law or in the federal, state, or local interpretation of existing law could result in this engine being subject to additional or different legal requirements. These conclusions are Archrock's and are not offered as legal opinions or advice to your company. Additionally, any reconstruction or modification respecting this engine or compressor (as those terms are defined in the applicable regulations) could result in the applicability of Subpart JJJJ, Subpart OOOO, Subpart OOOOa, or other legal requirements to this engine or compressor and create legal compliance responsibilities for your company.

CATERPILLAR®

G3508B LE Gas Petroleum Engine

515 bkW (690 bhp)
1400 rpm

0.5 g/bhp-hr NOx or 1.0 g/bhp-hr NOx (NTE)



CAT® ENGINE SPECIFICATIONS

V-8, 4-Stroke-Cycle

Bore	170 mm (6.7 in.)
Stroke	190 mm (7.5 in.)
Displacement	34.6 L (2115 cu. in.)
Aspiration	Turbocharged-2 Stage Aftercooled
Digital Engine Management	
Governor and Protection	Electronic (ADEM™ A3)
Combustion	Low Emissions (Lean Burn)
Engine Weight	
net dry (approx)	3941 kg (8688 lb)
Power Density	7.7 kg/kW (12.6 lb/hp)
Power per Displacement	19.9 bhp/L
Total Cooling System Capacity	130.5 L (34.4 gal)
Jacket Water	119 L (31.4 gal)
Aftercooler Circuit	11.5 L (3 gal)
Lube Oil System (refill)	220 L (58 gal)
Oil Change Interval	1000 hours
Rotation (from flywheel end)	Counterclockwise
Flywheel and Flywheel Housing	SAE No. 00
Flywheel Teeth	183

FEATURES

Engine Design
- Built on G3500 LE proven reliability and durability
- Ability to burn a wide spectrum of gaseous fuels
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Broad operating speed range at lower site air densities (high altitude/hot ambient temperatures)
- Higher power density improves fleet management
- Quality engine diagnostics
- Detonation-sensitive timing control for individual cylinders

Ultra Lean Burn Technology (ULB)
ULB technology uses an advanced control system, a better turbo match, improved air and fuel mixing, and a more sophisticated combustion recipe to provide:
- Lowest engine-out emissions
- Highest fuel efficiency
- Improved altitude and speed turndown
- Stable load acceptance and load rejection

Emissions
- Meets U.S. EPA Spark Ignited Stationary NSPS emissions for 2010 and some non-attainment areas
- Lean air/fuel mixture provides best available emissions and fuel efficiency for engines of this bore size

Advanced Digital Engine Management
ADEM A3 engine management system integrates speed control, air/fuel ratio control, and ignition/detonation controls into a complete engine management system. ADEM A3 has improved: user interface, display system, shutdown controls, and system diagnostics.

Full Range of Attachments
Large variety of factory-installed engine attachments reduces packaging time.

Testing
Every engine is full-load tested to ensure proper engine performance.

Gas Engine Rating Pro
GERP is a PC-based program designed to provide site performance capabilities for Cat® natural gas engines for the gas compression industry. GERP provides engine data for your site's altitude, ambient temperature, fuel, engine coolant heat rejection, performance data, installation drawings, spec sheets, and pump curves.

Product Support Offered Through Global Cat Dealer Network
More than 2,200 dealer outlets

Cat factory-trained dealer technicians service every aspect of your petroleum engine

Cat parts and labor warranty

Preventive maintenance agreements available for repair-before-failure options

S•O•S℠ program matches your oil and coolant samples against Caterpillar set standards to determine:
- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

Over 80 Years of Engine Manufacturing Experience
Over 60 years of natural gas engine production

Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products
- Cast engine blocks, heads, cylinder liners, and flywheel housings
- Machine critical components
- Assemble complete engine

Web Site
For all your petroleum power requirements, visit www.catoilandgas.cat.com.

STANDARD EQUIPMENT

Air Inlet System
Axial Flow Air cleaner
Cleanable
Single element canister type with service indicator

Control System
ADEM A3 with integrated electronic throttle control
CSA certified

Cooling System
Two-stage charge air cooling
  First Stage — JW + OC + 1st Stage AC
  Second Stage — 2nd Stage AC
Thermostats and housing
Gear-driven jacket and aftercooler water pump
Stainless steel aftercooler cores

Exhaust System
Dry exhaust manifolds
Exhaust outlet: 200 mm I.D.

Flywheels and Flywheel Housings
SAE No. 00 flywheel
SAE No. 00 flywheel housing
SAE standard rotation

Fuel System
7-50 psi gas supply
Electronic fuel metering valve
Gas pressure regulator, pivot valve operated

Ignition System
ADEM A3
Outdoor CSA certified

Lubrication System
Crankcase breather — top mounted
Oil cooler
Oil filter — RH
Oil pan
Oil sampling valve
Turbo oil accumulator

Power Take-Offs
Front housing — two-sided
Front lower — LH accessory drive

Torsional Vibration Analysis
Provided through Caterpillar, required through Q1 2010

General
Paint — Cat yellow
Crankshaft vibration damper and guard

OPTIONAL EQUIPMENT

Air Inlet System
Round air inlet adaptors

Charging System
Battery chargers
CSA certified version available with
  Charging system
  CSA alternator (24V, 65A)

Cooling System
Mechanical joint assembly connections

Exhaust System
Flexible fittings
Elbows
Flanges

Fuel System
Gas filter

Instrumentation
Advisor display panel
Communications module

Lubrication System
Lubricating oil
Oil bypass filter
Air prelube pump

Power Take-Offs
Front stub shaft
Pulleys

General
Special paint

EU Certification
EEC DOI certification

Support
Factory commissioning

TECHNICAL DATA

G3508B Gas Petroleum Engine — 1400 rpm

Fuel System		0.5 g NOx NTE Rating DM8826-00	1.0 g NOx NTE Rating DM8827-00
Engine Power			
@ 100% Load	bkW (bhp)	514.53 (690)	514.53 (690)
Engine Speed	rpm	**1400**	**1400**
Max Altitude @ Rated Torque and 38°C (100°F)	m (ft)	1524 (5000)	1828.8 (6000)
Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F)	%	36	36
Aftercooler Temperature			
Stage 1 (JW)	°C (°F)	95.0 (203)	95.0 (203)
Stage 2 (SCAC)	°C (°F)	54.44 (130)	54.44 (130)
Compression Ratio		8.0:1	8.0:1
Emissions*			
NOx	g/bkW-hr (g/bhp-hr)	0.67 (0.50)	1.34 (1.00)
CO	g/bkW-hr (g/bhp-hr)	3.46 (2.58)	4.01 (2.99)
CO_2	g/bkW-hr (g/bhp-hr)	639.67 (477)	610.17 (455)
VOC**	g/bkW-hr (g/bhp-hr)	0.74 (0.55)	0.58 (0.43)
Fuel Consumption***			
@ 100% Load	MJ/bkW-hr (Btu/bhp-hr)	10.26 (7254)	10.00 (7068)
@ 75% Load	MJ/bkW-hr (Btu/bhp-hr)	10.89 (7700)	10.68 (7549)
Heat Balance			
Heat Rejection to Jacket Water @ 100% Load			
JW	bkW (Btu/min)	190.24 (10,819)	1953.81 (111,111)
OC	bkW (Btu/min)	46.16 (2625)	46.16 (2625)
Heat Rejection to Aftercooler @ 100% Load			
1st Stage AC	bkW (Btu/min)	88.13 (5012)	74.28 (4224)
2nd Stage AC	bkW (Btu/min)	53.63 (3050)	48.62 (2765)
Heat Rejection to Exhaust @ 100% Load	bkW (Btu/min)	526.70 (29,953)	502.00 (28,548)
Heat Rejection to Atmosphere @ 100% Load	bkW (Btu/min)	61.51 (3498)	61.51 (3498)
Exhaust System			
Exhaust Gas Flow Rate @ 100% Load	m^3/min (cfm)	126.15 (4455)	120.37 (4251)
Exhaust Stack Temperature @ 100% Load	°C (°F)	499.44 (931)	512.78 (955)
Intake System			
Air Inlet Flow Rate @ 100% Load	m^3/min (scfm)	45.17 (1595)	42.28 (1493)
Gas Pressure	kPag (psig)	48-345 (7-50)	48-345 (7-50)

*at 100% load and speed, all values are listed as not to exceed

**Volatile organic compounds as defined in U.S. EPA 40 CFR 60, subpart JJJ

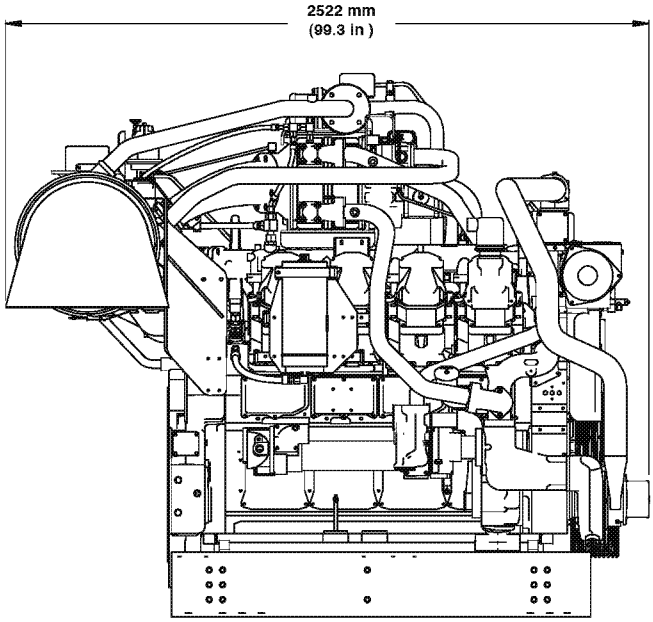
***ISO 3046/1

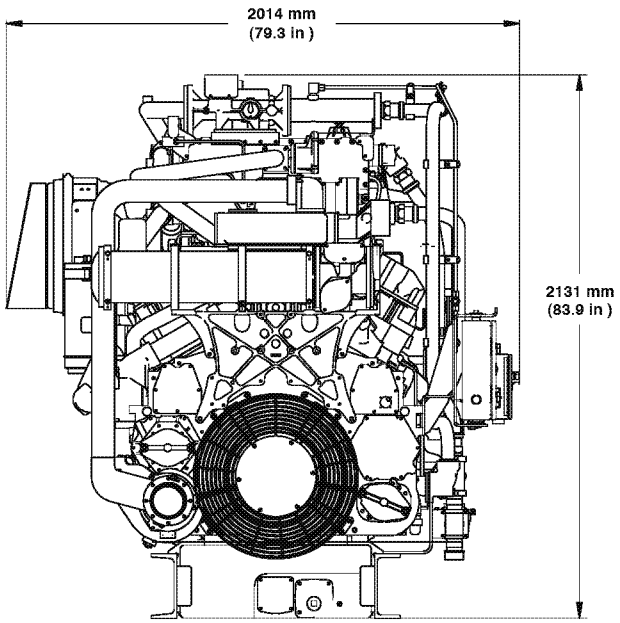
CATERPILLAR®

G3508B LE GAS PETROLEUM ENGINE

515 bkW (690 bhp)

G3508B — RIGHT SIDE VIEW & FRONT VIEW





DIMENSIONS		
Length	mm (in)	2522 (99.3)
Width	mm (in)	2014 (79.3)
Height	mm (in)	2131 (83.9)
Shipping Weight	kg (lb)	3941 (8688)

Note: General configuration not to be used for installation. See general dimension drawing number LA5250.

RATING DEFINITIONS AND CONDITIONS

Engine performance is obtained in accordance with SAE J1995, ISO3046/1, BS5514/1, and DIN6271/1 standards.

Transient response data is acquired from an engine/generator combination at normal operating temperature and in accordance with ISO3046/1 standard ambient conditions. Also in accordance with SAE J1995, BS5514/1, and DIN6271/1 standard reference conditions.

Conditions: Power for gas engines is based on fuel having an LHV of 33.74 kJ/L (905 Btu/cu ft) at 101 kPa (29.91 in. Hg) and 15° C (59° F). Fuel rate is based on a cubic meter at 100 kPa (29.61 in. Hg) and 15.6° C (60.1° F). Air flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and 25° C (77° F). Exhaust flow is based on a cubic foot at 100 kPa (29.61 in. Hg) and stack temperature.

Performance Numbers: DM8826-00, DM8827-00
LEHW0072-01 (1-10)

J-W POWER COMPANY

P.O. BOX 12340
LONGVIEW, TEXAS 75607
(903)643-3413

September 10, 2019

RE: Engine and compressor frame EPA regulatory status

J-W Power Company is supplying the following information for the natural gas fired engine source referenced below to aid in the permitting process. The information provided is a guide to help make applicability determinations regarding EPA NSPS 40 CFR Part 60 Subpart JJJJ, NSPS 40 CFR Part 60 Subpart OOOO, and/or NESHAP 40 CFR Part 63 Subpart ZZZZ only. Due to this being a guide, J-W Power Company in no way can guarantee the regulatory status or accuracy of the information, some data is provided by a third party.

Engine Make:	Caterpillar
Engine Model:	G3306B NAHCR
Engine Serial Number:	R6S05866
Combustion Type:	4-Stroke, Rich Burn
Engine NSPS Status[1]:	Applicable
Engine NESHAP Status[1]:	Applicable (Complies by Complying with NSPS JJJJ)
Rated Engine Speed:	1800 RPM
Nameplate Horsepower:	145 HP
Expected Horsepower[2]:	145 HP
Engine Manufacture Date[3]:	12/17/2018
Engine Modification Date[3]:	N/A
Engine Reconstruction Date[3]:	N/A
Compressor Make:	Ariel
Compressor Model:	JGQ-2
Compressor Serial Number:	F-58863
Compressor Manufacture Date:	Potentially Subject to NSPS OOOOa
J-W Unit number:	7506

[1] Pursuant to J-W Power Company interpretation of 40 CFR Part 60 Subpart JJJJ and Part 63 Subpart ZZZZ, the above mentioned unit has the potential to be subject to the requirements of these rules. These interpretations are in no way guaranteed by J-W Power Company or any of its affiliates and should not be viewed as legally substantiated. Additionally, there may be requirements associated with the applicability of Subpart JJJJ or ZZZZ that are not expressed herein. It is strongly encouraged to review the information provided in accordance with all relevant state and federal rules to ensure the compliance.

[2] The available horsepower may be limited by the maximum RPM rating of the compressor frame or may be modified from the nameplate rating due to conversion.

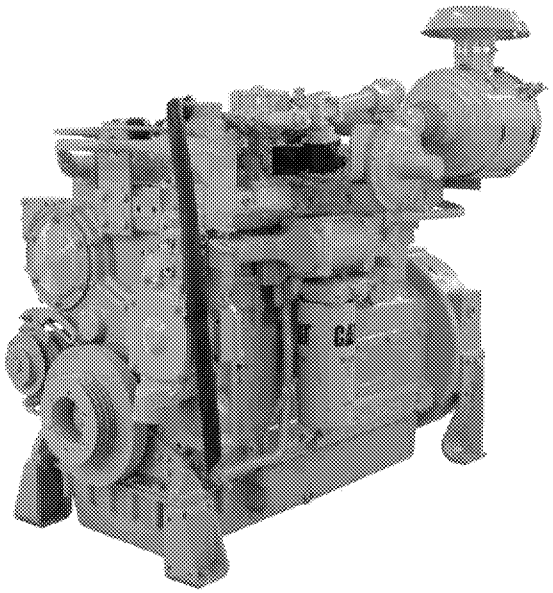
[3] The dates mentioned above are provided to J-W Power Company and may be subject to the interpretation of the engine manufacturer, engine dealer or others.

[4] For the purpose of this document let Modification and Reconstruction be defined by 40 CFR Part 60 Subpart JJJJ, Section 14 & 15 respectively.

G3306B NA Gas Petroleum Engine

108 bkW (145 bhp)
1800 rpm

0.5 g/bhp-hr NOx or 1.0 g/bhp-hr NOx (NTE)



CAT® ENGINE SPECIFICATIONS

In-Line 6, 4-Stroke-Cycle

Emissions	NSPS 2010
Bore	121 mm (4.8 in)
Stroke	152 mm (6.0 in)
Displacement	10.5 L (638 cu in)
Compression Ratio	10.5:1
Aspiration	Naturally Aspirated
Rotation (from flywheel end)	Counterclockwise
Flywheel & Flywheel Housing	SAE No. 1
Flywheel teeth	156
Shipping Weight (dry)	1022.3 kg (2253.8 lb)
Power Density	15.5 lb/hp
Power per Displacement	13.8 bhp/L
Capacity for Liquids — L (U.S. gal)	
Cooling System[1]	20 L (5.25 U.S. gal)
Lube Oil System (refill)	44.5 L (11.9 U.S. gal)
Oil Change Interval[2]	750 hours
Governor	Electronic ADEM™ A4
Ignition, Protection	Electronic ADEM A4
Air/Fuel Ratio Control	Electronic ADEM A4

[1]Engine only. [2]Can be extended through S•O•S℠ program

FEATURES

Engine Design
- Tough and durable, built on industry standard G3300 platform
- Caterpillar supplied air/fuel ratio control and three-way catalyst designed specifically for this engine to provide superior emissions control with NSPS and Non-Attainment zone compliance
- 0.5 g and 1 g NOx settings available
- Integrated operator interface panel, TWC and AFRC reduces hands-on time with the engine
- Operator interface panel allows setup and servicing without a laptop
- Runs on a broad range of fuels and speeds at any emissions level
- Factory installed components with single connection point eases packaging

Advanced Digital Engine Management
The ADEM A4 system represents the next generation of engine management systems while reducing the number of mechanical components and easing troubleshooting. Features include:
- Air/Fuel Ratio Control (AFRC)
- Electronic ignition
- Electronic governing/speed control
- Start/stop logic
- Engine protection & monitoring

Full Range of Attachments
Large variety of factory-installed engine attachments reduces packaging time

Gas Engine Rating Pro (GERP)
GERP is a PC-based program designed to provide site performance capabilities for Cat® natural gas engines for the gas compression industry. GERP provides engine data for your site's altitude, ambient temperature, fuel, engine coolant heat rejection, performance data, installation drawings, spec sheets, and pump curves.

Product Support Offered Through Global Cat Dealer Network
More than 2,200 dealer outlets

Cat factory-trained dealer technicians service every aspect of your petroleum engine

Caterpillar parts and labor warranty

Preventive maintenance agreements available for repair-before-failure options

S•O•S℠ program matches your oil and coolant samples against Catepillar set standards to determine:
- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

Over 80 Years of Engine Manufacturing Experience
Over 60 years of natural gas engine production

Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products.
- Cast engine blocks, heads, cylinder liners, and flywheel housings
- Machine critical components
- Assemble complete engine

Web Site
For all your petroleum power requirements, visit HYPERLINK "http://www.catoilandgas.cat.com" www.catoilandgas.cat.com.

STANDARD EQUIPMENT

Air Inlet System
Air cleaner — intermediate duty, dry
Air cleaner rain cap (shipped loose)
Service indicator

Control System
ADEM A4

Cooling System
Thermostats and housing — full open temperature 97°C (207°F)
Jacket water pump — gear-driven, centrifugal, non-self-priming

Exhaust System
Exhaust manifolds — watercooled
Exhaust elbow — dry
102 mm (4 in)
Three-way catalyst — 1.0 g NOx and 0.5 g NOx catalyst options

Flywheels & Flywheel Housings
Flywheel, SAE No. 1
Flywheel housing, SAE No. 1
SAE standard rotation

Fuel System
Air/fuel ratio control
Gas pressure regulator
Requires 10.3-34.5 kPa (1.5-5 psi) gas
Natural gas carburetor

Ignition System
ADEM A4 ignition

Lube System
Crankcase breather, top mounted
Oil cooler
Oil filter
Oil pan, full sump
Oil filler and dipstick

Protection System
The following parameters include alarm and shutdown

- oil pressure
- oil temperature
- coolant temperature
- engine speed (overspeed)
- battery voltage
- catalyst inlet/outlet temperature (sensors shipped loose)

Display only — service hours

OPTIONAL EQUIPMENT

Charging Alternator
24V, 35A alternator
24V, 35A CSA alternator*

Cooling System
Radiators
Jacket water pump inlet adapter

Exhaust System
Exhaust flex fitting — ANSI flange
Exhaust elbow
Exhaust flange — ANSI flange

Guards
Fan guard
Damper guard

Ignition System
CSA certified electronics and ignition*

Instrumentation
Operator interface panel
Operator interface panel enclosure
15', 20' and 50' interconnect harness

Starting System
Air pressure regulator
Air start silencer
Vane starter
Electric starter
Turbine starter

*CSA certification pending final approval

TECHNICAL DATA

G3306B Gas Petroleum Engine — 1800 rpm

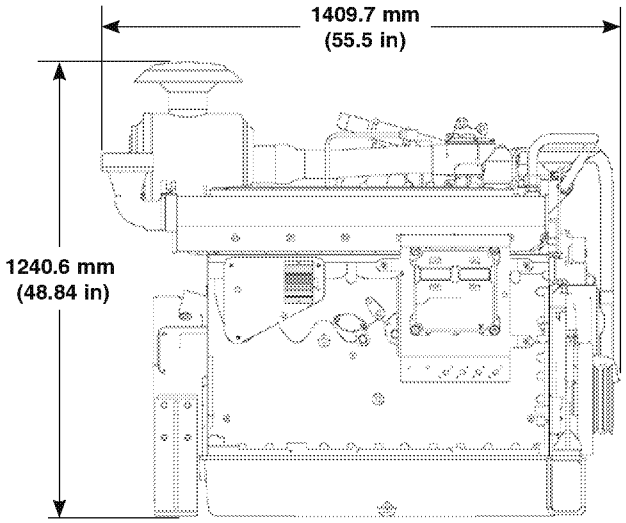
		DM8970-01 0.5 g NOx NTE	DM8798-01 1.0 g NOx NTE
Engine Power			
@ 100% Load	bkW (bhp)	108 (145)	108 (145)
Engine Speed	rpm	1800	1800
Max Altitude @ Rated Torque and 38°C (100°F)	m (ft)	0	0
Speed Turndown @ Max Altitude, Rated Torque, and 38°C (100°F)	%	48	48
Compression Ratio		10.5:1	10.5:1
Emissions (NTE)*			
NOx	g/bkW-hr (g/bhp-hr)	0.67 (0.5)	1.34 (1.0)
CO	g/bkW-hr (g/bhp-hr)	2.68 (2.0)	2.68 (2.0)
CO_2	g/bkW-hr (g/bhp-hr)	655.8 (489)	655.8 (489)
VOC**	g/bkW-hr (g/bhp-hr)	0.27 (0.20)	0.27 (0.20)
Fuel Consumption***			
@ 100% Load	MJ/bkW-hr (Btu/bhp-hr	11 (7775)	11 (7775)
@ 75% Load	MJ/bkW-hr (Btu/bhp-hr)	11.8 (8318)	11.8 (8318)
Heat Balance			
Heat Rejection to Jacket Water			
JW	bkW (Btu/min)	105.63 (6007)	105.63 (6007)
OC	bkW (Btu/min	15.76 (896)	15.76 (896)
Heat Rejection to Exhaust @ 100% Load	bkW (Btu/min	87.45 (4973)	87.45 (4973)
Heat Rejection to Atmosphere @ 100% Load	bkW (Btu/min	13.21 (751)	13.21 (751)
Exhaust System			
Exhaust Gas Flow Rate	m^3/min (cfm)	19.9 (706)	19.9 (706)
Exhaust Temperature — Catalyst Outlet @ 100% Load	°C (°F)	626.7 (1160)	626.7 (1160)
Intake System			
Air Inlet Flow Rate @ 100% Load	m^3/min (scfm)	5.92 (209)	5.92 (209)
Gas Pressure	psig (kPag)	1.5-10 (10-69)	1.5-10 (10-69)

*at 100% load and speed, listed as not to exceed

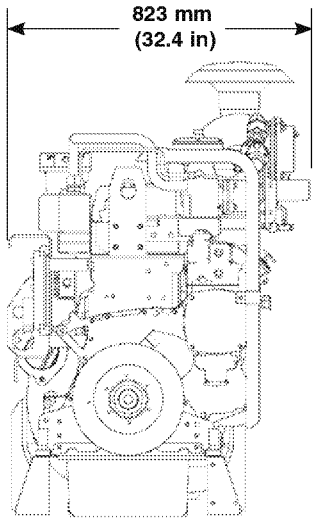
**Volatile organic compounds as defined in U.S. EPA 40 CFR 60, subpart JJJ

***ISO 3046/1

GAS PETROLEUM ENGINE



RIGHT SIDE VIEW



FRONT VIEW

DIMENSIONS		
Length	mm (in)	1409.7 (55.5)
Width	mm (in)	823 (32.4)
Height	mm (in)	1240.6 (48.84)
Shipping Weight	kg (lb)	1022.3 (2253.8)

RATING DEFINITIONS AND CONDITIONS

Engine performance is obtained in accordance with SAE J1995, ISO3046/1, BS5514/1, and DIN6271/1 standards.

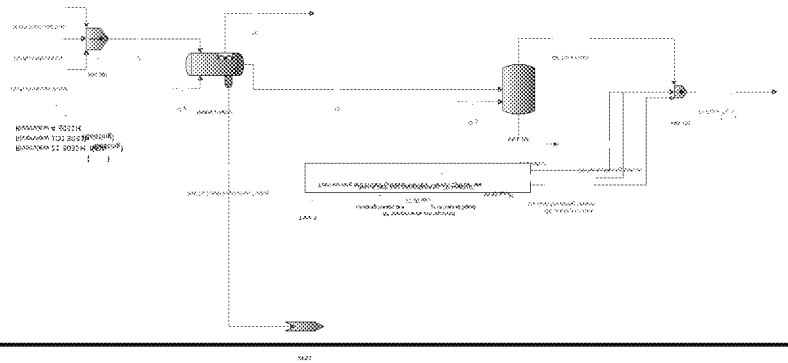
Transient response data is acquired from an engine/generator combination at normal operating temperature and in accordance with ISO3046/1 standard ambient conditions. Also in accordance with SAE J1995, BS5514/1, and DIN6271/1 standard reference conditions.

Conditions: Power for gas engines is based on fuel having an LHV of 33.74 kJ/L (905 Btu/cu ft) at 101 kPa (29.91 in Hg) and 15°C (59°F). Fuel rate is based on a cubic meter at 100 kPa (29.61 in Hg) and 15.6°C (60.1°F). Air flow is based on a cubic foot at 100 kPa (29.61 in Hg) and 25°C (77°F). Exhaust flow is based on a cubic foot at 100 kPa (29.61 in Hg) and stack temperature.

10.0 ProMax Output Report

North PF
Plant Schematic

Client Name:	EOG Resources, Inc.	Job:
Location:	Riverview 30 NWNW 1 Pad	
Flowsheet:	North PF	



Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	EOG Resources, Inc.	Job:	
Location:	Riverview 30 NWNW 1 Pad		
Flowsheet:	North PF		

Connections

	Oil Loading Losses	Oil Tank Breathing Losses	Oil Tank Flash	Oil Tank Working Losses	To Flare (FL-1)
From Block	--	--	VSSL-100	--	MIX-101
To Block	MIX-101	MIX-101	MIX-101	MIX-101	--

Stream Composition

Mole Fraction	Oil Loading Losses %	Oil Tank Breathing Losses %	Oil Tank Flash %	Oil Tank Working Losses %	To Flare (FL-1) %
Oxygen	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0
Water	0.005487	0.005487	5.7846	0.005487	4.88681
Carbon Dioxide	0.570888	0.570888	0.475975	0.570888	0.490719
Nitrogen	0.0377229	0.0377229	0.308607	0.0377229	0.266525
Methane	9.9056	9.9056	22.1911	9.9056	20.2826
Ethane	41.614	41.614	25.4142	41.614	27.9308
Propane	25.4149	25.4149	21.0015	25.4149	21.6871
Isobutane	2.97205	2.97205	2.78401	2.97205	2.81323
n-Butane	9.16481	9.16481	9.01476	9.16481	9.03807
Isopentane	3.12826	3.12826	3.43104	3.12826	3.384
n-Pentane	3.56018	3.56018	4.10101	3.56018	4.017
2-Methylpentane	1.06866	1.06866	1.44115	1.06866	1.38329
3-Methylpentane	0.425283	0.425283	0.580405	0.425283	0.556307
Heptane	0.675745	0.675745	1.15581	0.675745	1.08123
Octane	0.167251	0.167251	0.312225	0.167251	0.289704
Nonane	0.0242964	0.0242964	0.0531374	0.0242964	0.048657
Benzene	0.0907432	0.0907432	0.192289	0.0907432	0.176514
Toluene	0.101014	0.101014	0.227638	0.101014	0.207967
Ethylbenzene	0.0169198	0.0169198	0.0395653	0.0169198	0.0360473
m-Xylene	0.0440784	0.0440784	0.0779881	0.0440784	0.0727203
n-Hexane	0.955876	0.955876	1.32785	0.955876	1.27007
2,2,4-Trimethylpentane	0.0560336	0.0560336	0.0842086	0.0560336	0.0798316
C10+	0.000132154	0.000132154	0.000920903	0.000132154	0.000798371

Mass Fraction	Oil Loading Losses %	Oil Tank Breathing Losses %	Oil Tank Flash %	Oil Tank Working Losses %	To Flare (FL-1) %
Oxygen	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0
Water	0.00242547	0.00242547	2.66219	0.00242547	2.23474
Carbon Dioxide	0.616476	0.616476	0.535126	0.616476	0.5482
Nitrogen	0.0259293	0.0259293	0.22085	0.0259293	0.189524
Methane	3.89916	3.89916	9.09444	3.89916	8.25949
Ethane	30.7028	30.7028	19.5219	30.7028	21.3188
Propane	27.4981	27.4981	23.6576	27.4981	24.2748
Isobutane	4.23855	4.23855	4.1337	4.23855	4.15055
n-Butane	13.0703	13.0703	13.3851	13.0703	13.3345
Isopentane	5.53797	5.53797	6.32383	5.53797	6.19753
n-Pentane	6.30261	6.30261	7.55868	6.30261	7.35681
2-Methylpentane	2.25965	2.25965	3.17262	2.25965	3.0259
3-Methylpentane	0.899248	0.899248	1.27773	0.899248	1.2169
Heptane	1.66141	1.66141	2.9586	1.66141	2.75013
Octane	0.468773	0.468773	0.911105	0.468773	0.840016
Nonane	0.0764601	0.0764601	0.174101	0.0764601	0.158409
Benzene	0.17392	0.17392	0.383705	0.17392	0.34999
Toluene	0.228371	0.228371	0.535811	0.228371	0.486401

* User Specified Values
? Extrapolated or Approximate Values

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	EOG Resources, Inc.	Job:	
Location:	Riverview 30 NWNW 1 Pad		
Flowsheet:	North PF		

Mass Fraction	Oil Loading Losses %	Oil Tank Breathing Losses %	Oil Tank Flash %	Oil Tank Working Losses %	To Flare (FL-1) %
Ethylbenzene	0.0440754	0.0440754	0.107305	0.0440754	0.0971434
m-Xylene	0.114822	0.114822	0.211512	0.114822	0.195973
n-Hexane	2.02117	2.02117	2.92321	2.02117	2.77824
2,2,4-Trimethylpentane	0.157051	0.157051	0.245729	0.157051	0.231478
C10+	0.000707357	0.000707357	0.00513193	0.000707357	0.00442085

Mass Flow	Oil Loading Losses lb/h	Oil Tank Breathing Losses lb/h	Oil Tank Flash lb/h	Oil Tank Working Losses lb/h	To Flare (FL-1) lb/h
Oxygen	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0
Water	0.00043119	5.12256E-05	3.70365	0.000163722	3.7043
Carbon Dioxide	0.109595	0.0130199	0.744468	0.0416128	0.908696
Nitrogen	0.00460961	0.000547623	0.307247	0.00175025	0.314154
Methane	0.693178	0.0823498	12.6522	0.263197	13.6909
Ethane	5.45824	0.648441	27.1589	2.07247	35.338
Propane	4.88852	0.580758	32.9125	1.85615	40.2379
Isobutane	0.753514	0.0895177	5.75081	0.286107	6.87995
n-Butane	2.32358	0.276043	18.6214	0.882257	22.1033
Isopentane	0.984519	0.116961	8.79773	0.373819	10.273
n-Pentane	1.12045	0.13311	10.5156	0.425433	12.1946
2-Methylpentane	0.401712	0.0477236	4.41376	0.152529	5.01573
3-Methylpentane	0.159865	0.018992	1.77758	0.0607002	2.01714
Heptane	0.29536	0.0350889	4.11602	0.112147	4.55861
Octane	0.0833368	0.00990044	1.26753	0.0316427	1.39241
Nonane	0.0135928	0.00161483	0.24221	0.00516114	0.262578
Benzene	0.0309189	0.00367318	0.533811	0.0117398	0.580143
Toluene	0.0405989	0.00482317	0.745421	0.0154153	0.806259
Ethylbenzene	0.00783556	0.000930867	0.149283	0.00297514	0.161025
m-Xylene	0.0204127	0.00242504	0.294256	0.00775063	0.324845
n-Hexane	0.359317	0.042687	4.06677	0.136431	4.60521
2,2,4-Trimethylpentane	0.02792	0.00331691	0.341859	0.0106011	0.383697
C10+	0.000125751	1.49393E-05	0.00713955	4.77474E-05	0.00732799

Stream Properties

Property	Units	Oil Loading Losses	Oil Tank Breathing Losses	Oil Tank Flash	Oil Tank Working Losses	To Flare (FL-1)
Temperature	°F	64.4643	64.4643	95	64.4643	90.1422
Pressure	psia	11.3925	11.3925	12	11.3925	11.3925
Mole Fraction Vapor	%	100	100	100	100	100
Mole Fraction Light Liquid	%	0	0	0	0	0
Mole Fraction Heavy Liquid	%	0	0	0	0	0
Molecular Weight	lb/lbmol	40.755	40.755	39.1448	40.755	39.395
Mass Density	lb/ft^3	0.0835186	0.0835186	0.0796705	0.0835186	0.0767841
Molar Flow	lbmol/h	0.436207	0.0518216	3.55399	0.165626	4.20764
Mass Flow	lb/h	17.7776	2.11199	139.12	6.75011	165.76
Vapor Volumetric Flow	ft^3/h	212.858	25.2877	1746.2	80.8217	2158.78
Liquid Volumetric Flow	gpm	26.5382	3.15275	217.708	10.0765	269.146
Std Vapor Volumetric Flow	MMSCFD	0.00397281	0.000471971	0.0323684	0.00150846	0.0383216
Std Liquid Volumetric Flow	sgpm	0.076342	0.00906946	0.574166	0.0289868	0.688564
Compressibility		0.988351	0.988351	0.990513	0.988351	0.990628
Specific Gravity		1.40716	1.40716	1.35156	1.40716	1.3602
API Gravity						
Enthalpy	Btu/h	-19352.4	-2299.07	-168208	-7348.03	-197208
Mass Enthalpy	Btu/lb	-1088.58	-1088.58	-1209.09	-1088.58	-1189.72

* User Specified Values
? Extrapolated or Approximate Values

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	EOG Resources, Inc.	Job:
Location:	Riverview 30 NWNW 1 Pad	
Flowsheet:	North PF	

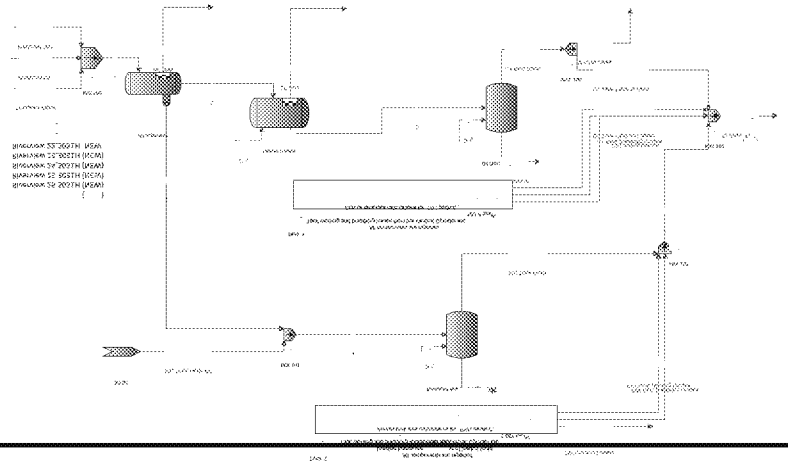
Stream Properties

Property	Units	Oil Loading Losses	Oil Tank Breathing Losses	Oil Tank Flash	Oil Tank Working Losses	To Flare (FL-1)
Mass Cp	Btu/(lb*°F)	0.402825	0.402825	0.424259	0.402825	0.420835
Ideal Gas CpCv Ratio		1.13852	1.13852	1.13656	1.13852	1.13682
Dynamic Viscosity	cP	0.00845072	0.00845072	0.00916474	0.00845072	0.0090492
Kinematic Viscosity	cSt	6.31669	6.31669	7.18128	6.31669	7.35729
Thermal Conductivity	Btu/(h*ft*°F)	0.0107963	0.0107963	0.0125163	0.0107963	0.0122391
Surface Tension	lbf/ft					
Net Ideal Gas Heating Value	Btu/ft^3	2132.33	2132.33	1988.61	2132.33	2010.94
Net Liquid Heating Value	Btu/lb	19704.7	19704.7	19111.7	19704.7	19207
Gross Ideal Gas Heating Value	Btu/ft^3	2319.8	2319.8	2166.34	2319.8	2190.18
Gross Liquid Heating Value	Btu/lb	21450.3	21450.3	20834.6	21450.3	20933.6

Remarks

South PF
Plant Schematic

Client Name:	EOG Resources, Inc.	Job:
Location:	Riverview 30 NWNW 1 Pad	
Flowsheet:	South PF	



Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	EOG Resources, Inc.	Job:	
Location:	Riverview 30 NWNW 1 Pad		
Flowsheet:	South PF		

Connections

	Oil Loading Losses	Oil Tank Breathing Losses	Oil Tank Flash to Flare	Oil Tank Working Losses	PW Loading Losses
From Block	--	--	SPLT-100	--	--
To Block	MIX-102	MIX-102	MIX-102	MIX-102	--

Stream Composition

Mole Fraction	Oil Loading Losses %	Oil Tank Breathing Losses %	Oil Tank Flash to Flare %	Oil Tank Working Losses %	PW Loading Losses %
Oxygen	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0
Water	0.00145459	0.00145459	1.83319	0.00145459	93.3433
Carbon Dioxide	0.317773	0.317773	0.299655	0.317773	2.38204
Nitrogen	0.0045241	0.0045241	0.0420447	0.0045241	0.0192107
Methane	2.80396	2.80396	7.07221	2.80396	2.95169
Ethane	34.6032	34.6032	23.7588	34.6032	1.22638
Propane	32.1608	32.1608	30.0434	32.1608	0.0692328
Isobutane	4.24738	4.24738	4.51045	4.24738	0.00110071
n-Butane	13.2286	13.2286	14.7072	13.2286	0.00462716
Isopentane	4.27549	4.27549	5.33257	4.27549	0.000243613
n-Pentane	4.63273	4.63273	6.06996	4.63273	4.73142E-05
2-Methylpentane	1.22707	1.22707	1.87887	1.22707	8.68941E-06
3-Methylpentane	0.431257	0.431257	0.668264	0.431257	1.43932E-05
Heptane	0.611231	0.611231	1.18627	0.611231	1.42745E-07
Octane	0.138539	0.138539	0.294865	0.138539	2.1942E-09
Nonane	0.0194599	0.0194599	0.0484843	0.0194599	6.26356E-11
Benzene	0.0921466	0.0921466	0.223188	0.0921466	0.00167303
Toluene	0.0890219	0.0890219	0.230534	0.0890219	0.000363022
Ethylbenzene	0.0139336	0.0139336	0.0375444	0.0139336	1.57071E-05
m-Xylene	0.0361267	0.0361267	0.073712	0.0361267	2.55083E-05
n-Hexane	1.01439	1.01439	1.60085	1.01439	1.44972E-06
2,2,4-Trimethylpentane	0.0508613	0.0508613	0.0870384	0.0508613	1.62563E-08
C10+	0.00010354	0.00010354	0.000839194	0.00010354	1.26342E-14

Mass Fraction	Oil Loading Losses %	Oil Tank Breathing Losses %	Oil Tank Flash to Flare %	Oil Tank Working Losses %	PW Loading Losses %
Oxygen	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0
Water	0.000580696	0.000580696	0.700208	0.000580696	89.6961
Carbon Dioxide	0.309907	0.309907	0.279606	0.309907	5.59171
Nitrogen	0.00280845	0.00280845	0.0249721	0.00280845	0.028705
Methane	0.996805	0.996805	2.4055	0.996805	2.52575
Ethane	23.057	23.057	15.1469	23.057	1.96695
Propane	31.4261	31.4261	28.0881	31.4261	0.162838
Isobutane	5.47056	5.47056	5.55828	5.47056	0.00341242
n-Butane	17.0382	17.0382	18.1239	17.0382	0.0143452
Isopentane	6.83571	6.83571	8.15726	6.83571	0.000937516
n-Pentane	7.40686	7.40686	9.28524	7.40686	0.000182083
2-Methylpentane	2.34327	2.34327	3.43288	2.34327	3.99413E-05
3-Methylpentane	0.823545	0.823545	1.22098	0.823545	6.6159E-05
Heptane	1.35722	1.35722	2.52021	1.35722	7.62931E-07
Octane	0.350682	0.350682	0.714128	0.350682	1.3369E-08
Nonane	0.0553073	0.0553073	0.131842	0.0553073	4.28494E-10
Benzene	0.159501	0.159501	0.369629	0.159501	0.00697061
Toluene	0.181763	0.181763	0.450355	0.181763	0.00178412

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	EOG Resources, Inc.	Job:	
Location:	Riverview 30 NWNW 1 Pad		
Flowsheet:	South PF		

Mass Fraction	Oil Loading Losses %	Oil Tank Breathing Losses %	Oil Tank Flash to Flare %	Oil Tank Working Losses %	PW Loading Losses %
Ethylbenzene	0.0327803	0.0327803	0.0845094	0.0327803	8.89458E-05
m-Xylene	0.0849919	0.0849919	0.16592	0.0849919	0.000144448
n-Hexane	1.93712	1.93712	2.92492	1.93712	6.66371E-06
2,2,4-Trimethylpentane	0.128745	0.128745	0.210797	0.128745	9.90479E-08
C10+	0.000500515	0.000500515	0.00388134	0.000500515	1.47007E-13

Mass Flow	Oil Loading Losses lb/h	Oil Tank Breathing Losses lb/h	Oil Tank Flash to Flare lb/h	Oil Tank Working Losses lb/h	PW Loading Losses lb/h
Oxygen	0	0	0	0	0
Sulfur Dioxide	0	0	0	0	0
Hydrogen Sulfide	0	0	0	0	0
Water	0.000678647	1.02866E-05	0.370741	0.000126797	2.37875
Carbon Dioxide	0.362181	0.00548975	0.148044	0.0676691	0.148293
Nitrogen	0.00328217	4.97495E-05	0.013222	0.000613234	0.000761262
Methane	1.16494	0.0176576	1.27364	0.217656	0.0669834
Ethane	26.9462	0.408437	8.01985	5.03458	0.0521639
Propane	36.727	0.556689	14.8719	6.86199	0.0043185
Isobutane	6.39332	0.0969066	2.94295	1.19451	9.0498E-05
n-Butane	19.9122	0.301818	9.59609	3.72034	0.000380436
Isopentane	7.98874	0.121089	4.31904	1.4926	2.48631E-05
n-Pentane	8.65624	0.131207	4.91628	1.61731	4.82887E-06
2-Methylpentane	2.73852	0.0415091	1.81761	0.511659	1.05925E-06
3-Methylpentane	0.962458	0.0145884	0.646476	0.179824	1.75455E-06
Heptane	1.58615	0.0240421	1.33438	0.296353	2.02331E-08
Octane	0.409834	0.00621205	0.378111	0.0765725	3.54549E-10
Nonane	0.0646365	0.000979726	0.0698067	0.0120765	1.13637E-11
Benzene	0.186406	0.00282544	0.195708	0.0348276	0.000184862
Toluene	0.212422	0.00321979	0.23845	0.0396885	4.7315E-05
Ethylbenzene	0.0383096	0.000580676	0.0447454	0.00715767	2.35886E-06
m-Xylene	0.0993281	0.00150556	0.0878499	0.0185582	3.83079E-06
n-Hexane	2.26386	0.0343145	1.54866	0.422975	1.76723E-07
2,2,4-Trimethylpentane	0.150461	0.00228062	0.111611	0.0281119	2.62676E-09
C10+	0.000584941	8.86623E-06	0.00205506	0.000109289	3.89865E-15

Stream Properties

Property	Units	Oil Loading Losses	Oil Tank Breathing Losses	Oil Tank Flash to Flare	Oil Tank Working Losses	PW Loading Losses
Temperature	°F	64.4643	64.4643	95	64.4643	64.4643
Pressure	psia	12.4657	12.4657	12	12.4657	0.321701
Mole Fraction Vapor	%	100	100	100	100	100
Mole Fraction Light Liquid	%	0	0	0	0	0
Mole Fraction Heavy Liquid	%	0	0	0	0	0
Molecular Weight	lb/lbmol	45.1265	45.1265	47.1652	45.1265	18.7478
Mass Density	lb/ft^3	0.101586	0.101586	0.0964074	0.101586	0.0010726
Molar Flow	lbmol/h	2.58978	0.0392545	1.12259	0.483869	0.141457
Mass Flow	lb/h	116.868	1.77142	52.9472	21.8353	2.65202
Vapor Volumetric Flow	ft^3/h	1150.43	17.4376	549.203	214.943	2472.52
Liquid Volumetric Flow	gpm	143.43	2.17403	68.472	26.7981	308.262
Std Vapor Volumetric Flow	MMSCFD	0.0235867	0.000357515	0.0102241	0.00440689	0.00128834
Std Liquid Volumetric Flow	sgpm	0.474057	0.00718551	0.204801	0.0885718	0.00587849
Compressibility		0.984476	0.984476	0.986266	0.984476	0.999678
Specific Gravity		1.5581	1.5581	1.62849	1.5581	0.647312
API Gravity						
Enthalpy	Btu/h	-120795	-1830.94	-54636.4	-22569	-14513.8
Mass Enthalpy	Btu/lb	-1033.6	-1033.6	-1031.9	-1033.6	-5472.76

* User Specified Values
? Extrapolated or Approximate Values

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	EOG Resources, Inc.	Job:
Location:	Riverview 30 NWNW 1 Pad	
Flowsheet:	South PF	

Stream Properties

Property	Units	Oil Loading Losses	Oil Tank Breathing Losses	Oil Tank Flash to Flare	Oil Tank Working Losses	PW Loading Losses
Mass Cp	Btu/(lb*°F)	0.398828	0.398828	0.4158	0.398828	0.435538
Ideal Gas CpCv Ratio		1.12501	1.12501	1.1134	1.12501	1.32147
Dynamic Viscosity	cP	0.00812845	0.00812845	0.00849367	0.00812845	0.0101146
Kinematic Viscosity	cSt	4.99518	4.99518	5.50002	4.99518	588.695
Thermal Conductivity	Btu/(h*ft*°F)	0.0100309	0.0100309	0.0110525	0.0100309	0.0118124
Surface Tension	lbf/ft					
Net Ideal Gas Heating Value	Btu/ft^3	2356.46	2356.46	2436.61	2356.46	48.5624
Net Liquid Heating Value	Btu/lb	19660.3	19660.3	19443.9	19660.3	24.9809
Gross Ideal Gas Heating Value	Btu/ft^3	2560.2	2560.2	2646.04	2560.2	100.499
Gross Liquid Heating Value	Btu/lb	21373.7	21373.7	21129	21373.7	1076.26

Remarks

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	EOG Resources, Inc.	Job:	
Location:	Riverview 30 NWNW 1 Pad		
Flowsheet:	South PF		

Connections

	PW Tank Breathing Losses	PW Tank Flash	PW Tank Working Losses	To Flare (FL-2)
From Block	--	Produced Water Storage Tanks	--	MIX-102
To Block	MIX-103	MIX-103	MIX-103	--

Stream Composition

Mole Fraction	PW Tank Breathing Losses %	PW Tank Flash %	PW Tank Working Losses %	To Flare (FL-2) %
Oxygen	0	0	0	0
Sulfur Dioxide	0	0	0	0
Hydrogen Sulfide	0	0	0	0
Water	93.3433	6.82168	93.3433	1.66416
Carbon Dioxide	2.38204	2.27042	2.38204	0.581145
Nitrogen	0.0192107	0.945853	0.0192107	0.138552
Methane	2.95169	52.4088	2.95169	10.3887
Ethane	1.22638	23.4153	1.22638	30.512
Propane	0.0692328	8.91611	0.0692328	28.4648
Isobutane	0.00110071	0.649032	0.00110071	3.813
n-Butane	0.00462716	2.74298	0.00462716	12.1226
Isopentane	0.000243613	0.624012	0.000243613	4.01559
n-Pentane	4.73142E-05	0.355056	4.73142E-05	4.3751
2-Methylpentane	8.68941E-06	0.13367	8.68941E-06	1.22614
3-Methylpentane	1.43932E-05	0.104025	1.43932E-05	0.440343
Heptane	1.42745E-07	0.0324203	1.42745E-07	0.663496
Octane	2.1942E-09	0.00387977	2.1942E-09	0.155869
Nonane	6.26356E-11	0.000494966	6.26356E-11	0.0235041
Benzene	0.00167303	0.202504	0.00167303	0.136503
Toluene	0.000363022	0.209379	0.000363022	0.137112
Ethylbenzene	1.57071E-05	0.0339521	1.57071E-05	0.0219521
m-Xylene	2.55083E-05	0.0656715	2.55083E-05	0.0485316
n-Hexane	1.44972E-06	0.0618543	1.44972E-06	1.01804
2,2,4-Trimethylpentane	1.62563E-08	0.00277596	1.62563E-08	0.0525502
C10+	1.26342E-14	4.70116E-05	1.26342E-14	0.000263946

Mass Fraction	PW Tank Breathing Losses %	PW Tank Flash %	PW Tank Working Losses %	To Flare (FL-2) %
Oxygen	0	0	0	0
Sulfur Dioxide	0	0	0	0
Hydrogen Sulfide	0	0	0	0
Water	89.6961	4.85616	89.6961	0.699525
Carbon Dioxide	5.59171	3.94834	5.59171	0.596758
Nitrogen	0.028705	1.04701	0.028705	0.0905622
Methane	2.52575	33.2228	2.52575	3.88866
Ethane	1.96695	27.8216	1.96695	21.4071
Propane	0.162838	15.5358	0.162838	29.2867
Isobutane	0.00341242	1.49063	0.00341242	5.17101
n-Butane	0.0143452	6.29979	0.0143452	16.4402
Isopentane	0.000937516	1.77903	0.000937516	6.75997
n-Pentane	0.000182083	1.01225	0.000182083	7.36519
2-Methylpentane	3.99413E-05	0.455176	3.99413E-05	2.46542
3-Methylpentane	6.6159E-05	0.354228	6.6159E-05	0.885403
Heptane	7.62931E-07	0.128367	7.62931E-07	1.55125
Octane	1.3369E-08	0.0175122	1.3369E-08	0.415433
Nonane	4.28494E-10	0.00250848	4.28494E-10	0.0703373

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	EOG Resources, Inc.	Job:	
Location:	Riverview 30 NWNW 1 Pad		
Flowsheet:	South PF		

Mass Fraction	PW Tank Breathing Losses %	PW Tank Flash %	PW Tank Working Losses %	To Flare (FL-2) %
Benzene	0.00697061	0.625045	0.00697061	0.248785
Toluene	0.00178412	0.762315	0.00178412	0.29477
Ethylbenzene	8.89458E-05	0.142433	8.89458E-05	0.054378
m-Xylene	0.000144448	0.275499	0.000144448	0.120219
n-Hexane	6.66371E-06	0.210627	6.66371E-06	2.04698
2,2,4-Trimethylpentane	9.90479E-08	0.0125299	9.90479E-08	0.140061
C10+	1.47007E-13	0.000405235	1.47007E-13	0.00134345

Mass Flow	PW Tank Breathing Losses lb/h	PW Tank Flash lb/h	PW Tank Working Losses lb/h	To Flare (FL-2) lb/h
Oxygen	0	0	0	0
Sulfur Dioxide	0	0	0	0
Hydrogen Sulfide	0	0	0	0
Water	0.0112674	0.803249	0.284978	1.47105
Carbon Dioxide	0.00070242	0.653087	0.0177657	1.25494
Nitrogen	3.60587E-06	0.173184	9.12003E-05	0.190446
Methane	0.00031728	5.49533	0.00802471	8.17757
Ethane	0.000247085	4.60191	0.00624932	45.0175
Propane	2.04554E-05	2.56974	0.000517362	61.5878
Isobutane	4.28662E-07	0.246562	1.08418E-05	10.8743
n-Butane	1.80201E-06	1.04204	4.55768E-05	34.5725
Isopentane	1.17769E-07	0.294266	2.97863E-06	14.2157
n-Pentane	2.28729E-08	0.167434	5.78506E-07	15.4885
2-Methylpentane	5.01735E-09	0.0752899	1.269E-07	5.18459
3-Methylpentane	8.31077E-09	0.0585922	2.10197E-07	1.86194
Heptane	9.5838E-11	0.021233	2.42395E-09	3.26216
Octane	1.67939E-12	0.00289666	4.24755E-11	0.873626
Nonane	5.38266E-14	0.000414923	1.36139E-12	0.147914
Benzene	8.75634E-07	0.103388	2.21467E-05	0.523178
Toluene	2.24117E-07	0.126093	5.66841E-06	0.61988
Ethylbenzene	1.11732E-08	0.0235595	2.82594E-07	0.114353
m-Xylene	1.81453E-08	0.0455697	4.58934E-07	0.252812
n-Hexane	8.37083E-10	0.0348395	2.11716E-08	4.30465
2,2,4-Trimethylpentane	1.24422E-11	0.00207255	3.1469E-10	0.294538
C10+	1.84667E-17	6.70292E-05	4.67064E-16	0.00282519

Stream Properties

Property	Units	PW Tank Breathing Losses	PW Tank Flash	PW Tank Working Losses	To Flare (FL-2)
Temperature	°F	64.4643	95 *	64.4643	72.6275
Pressure	psia	0.321701	12 *	0.321701	0.321701
Mole Fraction Vapor	%	100	100	100	100
Mole Fraction Light Liquid	%	0	0	0	0
Mole Fraction Heavy Liquid	%	0	0	0	0
Molecular Weight	lb/lbmol	18.7478	25.3069	18.7478	42.8581
Mass Density	lb/ft^3	0.0010726	0.0512179	0.0010726	0.00241444
Molar Flow	lbmol/h	0.000670041	0.653609	0.0169468	4.90672
Mass Flow	lb/h	0.0125618	16.5408	0.317715	210.293
Vapor Volumetric Flow	ft^3/h	11.7116	322.949	296.211	87098.1
Liquid Volumetric Flow	gpm	1.46014	40.2638	36.9302	10859
Std Vapor Volumetric Flow	MMSCFD	6.10247E-06	0.00595282	0.000154345	0.0446885
Std Liquid Volumetric Flow	sgpm	2.78447E-05	0.0833982	0.000704252	0.858746
Compressibility		0.999678	0.996093	0.999678	0.999659
Specific Gravity		0.647312	0.873778	0.647312	1.47977
API Gravity					

* User Specified Values
? Extrapolated or Approximate Values

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	EOG Resources, Inc.	Job:
Location:	Riverview 30 NWNW 1 Pad	
Flowsheet:	South PF	

Stream Properties

Property	Units	PW Tank Breathing Losses	PW Tank Flash	PW Tank Working Losses	To Flare (FL-2)
Enthalpy	Btu/h	-68.7477	-27874.2	-1738.78	-229513
Mass Enthalpy	Btu/lb	-5472.76	-1685.18	-5472.76	-1091.4
Mass Cp	Btu/(lb*°F)	0.435538	0.448031	0.435538	0.403633
Ideal Gas CpCv Ratio		1.32147	1.21316	1.32147	1.12971
Dynamic Viscosity	cP	0.0101146	0.0106928	0.0101146	0.00842666
Kinematic Viscosity	cSt	588.695	13.0332	588.695	217.881
Thermal Conductivity	Btu/(h*ft*°F)	0.0118124	0.0159658	0.0118124	0.0107843
Surface Tension	lbf/ft				
Net Ideal Gas Heating Value	Btu/ft^3	48.5624	1236.83	48.5624	2217.37
Net Liquid Heating Value	Btu/lb	24.9809	18403.4	24.9809	19476.1
Gross Ideal Gas Heating Value	Btu/ft^3	100.499	1359.88	100.499	2411.12
Gross Liquid Heating Value	Btu/lb	1076.26	20248.6	1076.26	21191.7

Remarks